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# County of Imperial

## General Plan





# County of Imperial

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## General Plan

- I. LAND USE ELEMENT
- II. HOUSING ELEMENT (Revised 10/90)
- III. CIRCULATION AND SCENIC HIGHWAYS ELEMENT
- IV. NOISE ELEMENT
- V. SEISMIC AND PUBLIC SAFETY ELEMENT
- VI. AGRICULTURAL ELEMENT
- VII. CONSERVATION AND OPEN SPACE ELEMENT
- VIII. GEOTHERMAL AND TRANSMISSION ELEMENT
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# County of Imperial

## General Plan

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overview

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# IMPERIAL COUNTY GENERAL PLAN OVERVIEW

## I. INTRODUCTION

### A. Preface

The Imperial County General Plan consists of nine Elements entitled Land Use, Housing, Circulation and Scenic Highways, Noise, Seismic and Public Safety, Agricultural, Conservation and Open Space, Geothermal and Transmission, and Water. Also included in the General Plan is a Land Use Map designating a series of land use categories which identifies locations, and describes the type and anticipated maximum allowable density of ultimate development.

This comprehensive General Plan has been developed following a thorough examination of the County's physical and cultural resources, socio-economic conditions, and business climate. It provides a balance of land use policies and programs which seek to maintain the "quality of life" in the region. The General Plan is a dynamic document in that it can and should be amended as needed to respond to changing community and regional goals, physical and public infrastructure resources, and social concerns.

The General Plan presented herein is the product of a cooperative effort on the part of County staff, a community Ad Hoc Advisory Committee, Planning Commission, Board of Supervisors, and many citizens and groups. This effort began in 1987 and was completed in 1993. The Plan is aimed at creating a comprehensive guide for development within the County and provides mechanisms to achieve desired community goals and objectives through a coordinated implementation program.

This Overview is not an adopted Element of the General Plan, but rather is intended to provide a wide range of historical, statistical, and other informative data about the County in one document and, at the same time, supplement each of the Elements by avoiding repetitious statistics. This Overview may be revised, without being considered a General Plan Amendment, as updated information becomes available.

### B. What is a General Plan?

A General Plan is the public document required by state law (Government Code Section 65300 *et seq.*) and adopted by local government as the policy guide concerning the desirable future physical development of a community. It serves to express in text and diagram form the type of physical environment and the organization of physical development within the community, in order to create a functional, healthy, decent, and efficient place in which to live. It also serves to provide sufficient information about the long range goals of the community in order to enable public and private interests to coordinate their activities and to work in harmony toward creating a desirable community. Finally, the General Plan serves to provide technical knowledge about the area's resources and potential so that future growth and change may be directed in an orderly and well planned fashion.

# INTERNAL CONTROL PLAN OVERVIEW

## 1. INTRODUCTION

### 1.1 Purpose

The purpose of this document is to provide a clear and concise overview of the Internal Control Plan. This plan is designed to ensure that all internal controls are properly implemented and maintained, thereby reducing the risk of errors and fraud. The plan is based on the principles of internal control and is intended to be used as a guide for all employees.

The Internal Control Plan is a comprehensive document that outlines the organization's internal control system. It includes a description of the organization's internal control environment, the internal control framework, and the internal control procedures. The plan is designed to be used as a guide for all employees and is intended to be updated regularly to reflect changes in the organization's internal control system.

The Internal Control Plan is a key component of the organization's internal control system. It provides a clear and concise overview of the internal control system and is intended to be used as a guide for all employees. The plan is designed to be updated regularly to reflect changes in the organization's internal control system.

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## 2. Internal Control Framework

The Internal Control Framework is a key component of the organization's internal control system. It provides a clear and concise overview of the internal control system and is intended to be used as a guide for all employees. The plan is designed to be updated regularly to reflect changes in the organization's internal control system.



The general plan seeks to direct growth, particularly urban development, to areas where public infrastructure exists or can be provided, where public health and safety hazards are limited, and where impacts to the County's abundant natural, cultural, and economic resources can be avoided. This directive nature of the general plan is needed in order to provide for the preservation and conservation of adequate scenic, recreational, and wildlife habitat open space, agricultural areas, mineral resources, and the air and water quality of the County.

### C. Legislative Mandate

For the reasons stated above, the California legislature has established the General Plan as the comprehensive statement of public policy by which to evaluate all decisions regarding the development of land, the extension of public infrastructure, and the conservation and wise use of natural resources.

Preparation of the General Plan responds to requirements set forth by the State of California Government Code Section 65300, which states that each "county or city shall adopt a comprehensive, long-term general plan for the physical development of the county or city...." Further, Government Code Section 65302 continues that, "The general plan shall consist of a statement of development policies and shall include a diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals." The Government Code identifies seven required elements of a General Plan, which are the following: Land Use Element, Circulation Element, Housing Element, Conservation Element, Open Space Element, Noise Element, and Safety Element.

The seven mandatory elements included in the Imperial County General Plan are briefly described below:

- The **Land Use Element** designates the general distribution, location, and extent (including standards for population density and building intensity) of the uses of land for housing, business, industry, agriculture, open space, public facilities, and other categories of public and private uses.
- The **Housing Element** (amended October 23, 1990) identifies existing and projected housing needs and establishes goals, policies, objectives, and programs for the preservation, improvement, and development of housing to meet the needs of all economic sectors of the community.
- The **Circulation and Scenic Highways Element** identifies the location and extent of transportation routes and facilities. It is intended to meet the transportation needs of local residents and businesses, and as a source for regional coordination. The inclusion of Scenic Highways provides a means of protecting and enhancing scenic resources within highway corridors in Imperial County.
- The **Noise Element** examines noise sources and provides information to be used in setting land use policies to protect noise sensitive land uses and for developing and enforcing a local noise ordinance.





- The **Seismic and Public Safety Element** identifies goals and policies that will minimize the risks associated with natural and human-made hazards, and specifies land use planning procedures that should be implemented to avoid hazardous situations.
- The **Conservation and Open Space Element** provides detailed plans and measures for the preservation and management of biological and cultural resources, soils, minerals, energy, regional aesthetics, air quality, and open space.

As provided by Government Code Section 65301(a), the County of Imperial has chosen to combine the Open Space Element with the Conservation Element and incorporate Scenic Highways, an optional element, with the Circulation Element. The County has also chosen to include three other optional elements, as permitted by Government Code Section 65303, and which comply with requirements that are requisite to all Elements within the General Plan and have the same force and effect as the mandatory Elements. These optional Elements are described below:

- The **Agricultural Element** describes the status and trends of local agriculture and expresses community goals with regard to conserving productive agricultural lands within the County and minimizing or avoiding conflicts with urban and other land uses.
- The **Geothermal and Transmission Element** contains the latest knowledge about local geothermal resources, current development technology, and County, State, and federal policy regarding the exploration, development, and transmission of geothermal energy.
- The **Water Element** identifies and analyzes the sources and availability of water within the County and establishes policies and programs to maintain its availability, conserve its use, and preserve its quality.





## II. IMPERIAL COUNTY: A CONCISE HISTORY

### A. Native American Period

A generally accepted outline of Imperial County cultural history is recognized by the archaeological community, with the realization that many details are not yet fully understood. Yet evidence clearly indicates occupancy as early as 12,000 years ago. Based on the earliest relics, rock features, and cleared circles discovered to date, hunter-gatherer patterns of occupation existed until about the time of the filling of Lake Cahuilla at about A.D. 1050.

In the northern Colorado Desert, the Cahuilla and Chemhuevi bands represented a Shoshonean intrusion between 1000 and 1500 years ago. These peoples occupied portions of the Lake Cahuilla shoreline and the Colorado River region. The closely related Kumeyaay and Yuman peoples inhabited the Colorado Desert and lower Colorado River area, respectively.

Desert Cahuilla inhabited the northern end of the Salton Trough in Coachella Valley. Lines of trade and communication existed between the Shoshonean-speaking Cahuilla and the Yuman-speaking Kumeyaay neighbors to the south. Aggressive interactions between these peoples were rare.

Cultural descriptions of these Native American groups, from the time of early European contact to the present, have been preserved in the writings of explorers, soldiers, settlers, ethnographers, and Native Americans. Based upon these written works of two centuries, a rather complete picture of native Colorado Desert people can be recreated.

The agriculturally-oriented Yuman, who call themselves Kwichyana or Kuchiana, were first named "Yuman" by Friar Kino in the early 1700's. Today, the Native Americans of this region identify themselves as Quechan, a derivation of the Kwichyana (or Kuchiana) name.

Due to their location along the lower Colorado River, the Quechan people experienced the earliest European contact in Southern California. The first European to encounter the Quechan was Hernando de Alarcon when he sailed up the Rio de los Tizones (Colorado River) in 1540.

Following the early explorers, missionaries entered the Colorado River region. The Kumeyaay were first encountered by the Spanish during the 1775 expedition of Juan Bautista de Anza and Father Hermengildo and later by Francisco Garces in 1781. The establishment of missions in Yuman territory, however, was not successful. Two missions were established in 1779 only to be destroyed within two years by Quechans rebelling against a regimented regime. A punitive force of Spanish soldiers under Pedro Fages was sent to the territory, but the missions were not rebuilt or reoccupied.

Following this exploratory period by the Spanish, few contacts between Native Americans and Anglos occurred until gold rush immigrants passing through the Gila/Colorado River along the Southern Immigrant Trail traveled across the Valley in 1848 and 1849. Due to numerous hostile confrontations during this period, the United States established the military fortification of Fort Yuma.



As settlers entered the Imperial-Mexicali Valley and adjacent areas, inevitable conflicts occurred due to the competition for the scarce water and arable land within the desert. Native American lifestyles were jeopardized by disease, drought, white settlement, and assimilation into Anglo Imperial Valley or onto Indian Reservations.

## **B. Settlement of Imperial Valley**

In the nineteenth century, Imperial Valley held little attraction for settlers. The stage routes along the Southern Emigrant Trail and the Alternate Eastern Route to San Diego were the main transportation corridors through the valley in the early years. Although many people traveled through Imperial Valley, few recognized its agricultural potential.

Attempts were made in the latter half of the nineteenth century to irrigate and develop Imperial Valley; however, lack of funds as well as water and government restrictions deterred any substantial development. The initial irrigation of Imperial Valley eventually resulted from the efforts of Charles R. Rockwood and George Chaffey, experienced water engineers who organized the California Development Company in the early 1890's. To entice settlers, the developers called the newly irrigated area, the Imperial Valley.

In March of 1900, surveys for a feasible canal route from the Colorado River to Imperial Valley were conducted and the Imperial Land Company was formed as a subsidiary of the California Development Company. The Imperial Land Company was organized to promote opportunities for agricultural and other development of the Valley and to bring in settlers. The settlers would be able to claim government land under the Desert Land Act.

The California Development Company succeeded in conveying the first irrigation water to Imperial Valley in 1901, with the opening of the Alamo Canal. The Alamo Canal project spawned a series of towns and the large agricultural area in Imperial Valley. The community of Imperial was laid out in 1901.

From 1901 to 1905, Imperial Valley developed rapidly as land was cleared and more irrigation and drainage ditches were completed. By 1907, the California Development Company had succeeded in attracting nearly 15,000 people and Imperial County, originally part of San Diego County, was incorporated as a separate jurisdiction.

Initially, the transcontinental line of the Southern Pacific Railroad was located along the north end of Imperial Valley and northeast of the Algodones Dunes to Yuma. To serve the new settlements in Imperial Valley, a branch line was built from Niland in the spring of 1903, permitting increased commercial export of agricultural products.

A faulty canal entry on the Colorado River caused disastrous flooding in the Imperial Valley between 1905 and 1907, inundating new and valuable agricultural lands and creating the Salton Sea in the north end of Imperial County. Following a monumental effort by the California Development Company and the Southern Pacific Company, the river was turned back into its previous channel.



In the wake of this flood and to prevent future flooding, the residents of Imperial Valley were forced to make major improvements of the irrigation system. By 1916 the Imperial Irrigation District had bought the rights and property of the California Development Company and Southern Pacific Company, and settlement of Imperial Valley expanded along with the growth of agriculture.

The All-American Canal was completed in 1941, eliminating those portions of the supply systems previously located in Mexico and a reliable water supply was assured. Agriculture still continues to be the predominant activity in Imperial Valley, however, other major industries are now becoming part of a wider economic base such as geothermal energy development, mining, customs brokers, tourism, and the provision of essential regional and national facilities such as correctional institutions and military training facilities.





### III. HUMAN AND NATURAL RESOURCES

Imperial County is located in the southeast corner of California. It is bordered on the west by San Diego County, on the north by Riverside County, on the east by the Colorado River which forms the Arizona boundary, and on the south by 84 miles of the International Boundary with the Republic of Mexico (Baja California). The County covers an area of 4,597 square miles or 2,942,080 acres.

Approximately fifty percent of County lands are undeveloped and under federal ownership and jurisdiction. Presently, one-fifth of the nearly 3 million acres of the County is irrigated for agricultural purposes, most notably the central area known as Imperial Valley. The developed area, where the County's incorporated cities, unincorporated communities, and supporting facilities are situated comprises less than one percent of the land. Approximately seven percent of the County is the Salton Sea. The following table, which also appears in the Land Use Element, shows generalized land uses for the County.

IMPERIAL COUNTY LAND USE DISTRIBUTION (IN ACRES*)		
Irrigated (Agriculture)		
	Imperial Valley	512,163
	Bard Valley (Including Reservation)	14,737
	Palo Verde Valley	7,428
	<b>Total</b>	<b>534,328 (18.2%)</b>
Developed		
	Incorporated	9,274
	Unincorporated	8,754
	<b>Total</b>	<b>18,028 (0.6%)</b>
Salton Sea**		211,840 (7.2%)
Desert/Mountains		
	Federal	1,459,926
	State	37,760
	Indian	10,910
	Private	669,288
	<b>Total</b>	<b>2,177,884 (74.0%)</b>
<b>IMPERIAL COUNTY TOTAL</b>		<b>2,942,080 Acres</b>
* All acreages are approximations and should, therefore, only be used for informational purposes.		
** Calculated at elevation of -230.		





## A. Social Characteristics

### 1. County Population

Imperial County Planning Department bases its population estimates on building permits and housing unit change. From this annual compilation the Population Research Unit of the California Department of Finance (DOF) estimates the annual change in population. According to 1992 DOF estimates, the unincorporated area population is 28,826 and the total County population is 117,421. This compares to the 1990 census results of 27,360 for the unincorporated area and 109,303 for the entire County. The following table, also from the Land Use Element, presents the 1990 census data.

IMPERIAL COUNTY POPULATION AND HOUSING (1990)		
Community	Population	Housing Units
Brawley	18,923	6,124
Calexico	18,633	4,832
Calipatria	2,690	757
El Centro	31,384	10,180
Holtville	4,820	1,477
Imperial	4,113	1,372
Westmorland	1,380	432
City Subtotal	81,943	25,174
Unincorporated Area	27,360	11,375
<b>Total</b>	<b>109,303</b>	<b>36,549</b>
Source: Bureau of the Census/U.S. Department of Commerce		
IMPERIAL COUNTY POPULATION AND HOUSING UNINCORPORATED COMMUNITIES 1990		
Community	Population	Housing Units
Heber	2,566	600
Niland	1,183	535
Seeley	1,228	365
Ocotillo, Nomirage, Plaster City	719	648*
Salton Sea	1,953	1,263
Winterhaven/Bard	3,155	1,637*
<b>Total</b>	<b>10,804</b>	<b>5,048</b>
* Estimated from 1980 figures, adjusted based on 1990 population. Source: 1990 Census, Department of Finance		



Population in the unincorporated areas of the County tends to concentrate in agricultural areas and in recreation/retirement communities. Agriculture related unincorporated communities include the townsites of Heber, Niland, and Seeley in the Imperial Valley. Along the Colorado River, in the eastern portion of the County, small population clusters also exist within the townsites of Palo Verde and Winterhaven. Recreation/retirement communities include Ocotillo/Nomirage located in the southwest portion of the County, and Hot Mineral Spa and Bombay Beach on the northeastern shore of the Salton Sea. The West Shores communities of Salton City, Salton Sea Beach, and Desert Shores are also largely retirement and recreation communities, though increasingly their populations are becoming more diversified. These communities experience a noticeable increase in population during the winter months when visitors converge to the area to avoid cold, wet winters in other parts of the United States and Canada.

The County of Imperial has a slightly different age distribution than the state average in the proportion of children between the age group 0-19 (38%). The 5-14 year old group (21%) is significantly larger than the state average (14.85%) which indicates that there is a larger than average percentage of school age children. Consequently, school enrollments will not decline. Persons over 55, however, lag behind in the age proportion (18%) compared to the California average (19.71%).

The seven incorporated cities of Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland, account for 75 percent of the total population; and, in the past, have grown at a faster pace than the rural areas. The City of El Centro is the County Seat and, with a 1990 population of 31,384, the largest city in the County and the administrative, financial, medical, and governmental center for the region.

## **2. Income**

Imperial County's 1992 median family income, as estimated by the State Department of Finance, was \$31,500. This is similar to many of the state's rural counties, but less than the state's agricultural counties. Families classified as living in poverty, as defined by the Federal Bureau of the Census, constituted 23.8% of the County population in 1990, the highest rate of any California county, and a significant increase from 1980 when 15.3% of the County population was identified by the federal census as living in poverty. The federal poverty level for a family of four is an annual household income of \$12,675. Statewide, 12.5% of the population fell below the poverty level in 1990. Unlike many California counties where poverty overwhelming burdens black or Hispanic residents, Imperial County's rate was not substantially different, with 22.5% of white, 27.8% of black, and 29.4% of Hispanic residents reporting incomes below the poverty level.

## **3. Employment**

Agriculture and its related industries constitute the predominant economic base in Imperial County and is the largest employer with 35.1% of the work force. Government is the second largest employer with 21.3%, followed by retail trade with 15.2%. Due to the County's good soils, a year-round growing season, gently sloping topography and complex system of irrigation canals, it has become one of the most productive agricultural regions in the world. Although agriculture is the dominant economic base, agricultural employment in Imperial County has slowly decreased. The 1990 annual average farm employment was estimated at 14,500 persons, down 400 from the previous





year's average. The total crop valuation for agricultural commodities as compiled by the Office of Agricultural Commissioner showed a total valuation of \$1,106,811,000 in 1990.

Other significant contributors to the local economy are government; retail trade; winter visitors or "snowbirds"; the construction of two state prisons in the County; the growth of the geothermal industry in the area; mining of gold, aggregate, and other mineral resources; the expansion of the Naval Air Facility; an additional Mexico/USA border crossing; and approval of the North American Free Trade Agreement (NAFTA).

Of particular concern is the County's high unemployment rate which ranges between 30-40% annually, compared to 7-10% for the rest of California. In September 1992, the County Community Economic Development office estimated unemployment at 33.1% countywide. While much of this unemployment can be attributed to the presence of seasonally unemployed agricultural workers from Mexico and locally registered with the State Employment Development Department (EDD), an estimate of this factor is not known.

#### **4. Housing**

Based on 1990 housing information by the Bureau of the Census and Department of Finance, Imperial County had 36,549 housing units of which 21,749 or 59% were single-family units; 7,428 or 20% were multi-family units; and 7,382 or 20% were mobile homes. Mobile homes are particularly prevalent in the unincorporated areas of the County.

In the unincorporated portion of Imperial County the overall vacancy rate in 1990 was 16.74%, compared to 7.64% for the County total. This higher rate can be accounted for by the higher percentage of seasonally occupied housing units which are located in the County's desert communities, particularly around the Salton Sea.

#### **5. Urban Services**

##### **a. Water and Sewer**

The history of Imperial County is tied to the availability of water, and the availability of this resource will play an important role in determining the population and economic growth of the region. Imperial Irrigation District (IID) distributes water to over 500,000 acres of farmland as well as to ten communities in the County for domestic purposes: Calexico, Holtville, El Centro, Imperial, Brawley, Westmorland, Calipatria, Niland, Seeley, and Heber. Each of these cities and unincorporated communities has its own water treatment facilities for treating and distributing water within its jurisdiction. Ocotillo/Nomirage is provided water service by private water companies and individual wells; Palo Verde by the Palo Verde County Water District; and Hot Mineral Spa/Bombay Beach by the Coachella Valley Water District. The Winterhaven Water District (WWD) supplies water to approximately 1,000 customers in Winterhaven.

Water service for non-drinking domestic use in rural areas has also historically been provided from IID canals and laterals. Because this water has not received treatment for human consumption, these rural customers supplement the IID water with drinking water delivered by private companies to 100-



gallon water storage tanks at each home. On December 22, 1992, the U.S. Environmental Protection Agency (EPA) directed IID to stop new residential connections to their canals, to advise existing customers of the health dangers from drinking canal water, and to develop a plan to provide water treatment for rural domestic water users.

Sewage treatment is provided by each of the cities and by the unincorporated communities of Heber, Niland, Seeley, and Winterhaven. These sewage treatment plants are licensed by the California Regional Water Quality Control Board (CRWQCB) for the Colorado River Basin and generally provide primary and secondary treatment. Rural residences on existing lots and minor subdivisions utilize septic tanks and leach line systems which generally require a minimum lot size of 20,000 square feet (approximately one half acre) per dwelling unit for approval by the County Health Department. Bombay Beach has a public sewage system operated by the Coachella Valley Water District, while Hot Mineral Spa relies on subsurface septic systems or facilities operated by mobilehome and RV Parks. Ocotillo/Nomirage and Palo Verde have no sewage treatment facilities and also rely on subsurface septic systems.

#### **b. Solid Waste Disposal Facilities**

All cities regulate waste storage and disposal and provide for waste collection services within their jurisdiction, utilizing either a city-operated system or a contract with a private firm. Waste collection services are available in some unincorporated areas through contract with private firms.

Currently there are ten County-operated Class III disposal sites throughout Imperial County which accept non-hazardous wastes. Three of the County landfills, near Brawley, Imperial, and Calexico, are under the ownership or control of the County; six, Holtville, Niland, Salton City, Hot Mineral Spa, Ocotillo, and Palo Verde, are on Bureau of Land Management (BLM) property; and one, the Picacho landfill, serves the Winterhaven/Bard area and is located on land owned by the Quechan Indian Reservation.

In addition to the public sites, Imperial Republic Acquisitions operates a private Class III waste disposal facility in the unincorporated area northwest of the City of Imperial; Laidlaw Environmental Services operates a Class I facility west of the City of Westmorland; and Desert Valley Company operates a Class II solid waste disposal/storage site northwest of the City of Westmorland.

For more detailed information on solid and hazardous waste disposal sites, please refer to the Health Department, Imperial County Hazardous Waste Management Plan. The Imperial County Integrated Waste Management Plan is being prepared by the Department of Public Works, with a draft to be presented to the State Integrated Waste Management Board in January 1994.

#### **c. Power/Gas**

Electrical power requirements for residential, commercial and industrial uses within Imperial County are provided by the Imperial Irrigation District (IID). The only exception is the Palo Verde area where power is supplied by Southern California Edison.





In 1984, IID was connected to the new 500-KV Southwest Powerlink. This transmission system can be utilized to import resources for the District's needs and to export geothermal energy. The IID and geothermal industry recently completed the Heber to Coachella Valley 230 KV line through a mutually-agreed upon financing arrangement.

Liquid petroleum products come to and pass through the County via the twenty inch Santa Fe Pacific Pipe Lines. This line, generally within the Southern Pacific Railroad right-of-way, follows the northwest to southeast trend of the County. The main storage facility is located at Aten and Clark Roads just east of Imperial. Natural gas comes to the County in parallel eight to ten inch lines of the Southern California Gas Company which run generally straight south through the County.

#### **d. Public Safety**

The Sheriff's Department is responsible for enforcement of State laws and County ordinances, operation of jail detention facilities, prevention of crime, and apprehension of criminals in unincorporated areas. The adult detention facilities include the County jail and minimum security facility.

Sheriff substations are located in the communities of Brawley, Salton City, and Winterhaven, with resident deputies located in the unincorporated communities of Ocotillo, Bombay Beach, Niland and Palo Verde. All other areas are patrolled by the main patrol division.

Additional public safety is provided by the County Fire Department/Office of Emergency Services in cooperation with the incorporated cities and volunteer units in the unincorporated communities. The County Fire Department's main facility is located at the County Airport in Imperial.

#### **e. Regional Transportation**

Interstate 8 (I-8) is the primary east/west route through the County between San Diego and Yuma, Arizona. It passes through the City of El Centro and provides connections via State Routes 86 and 111 to Heber and Calexico to the south and to Imperial and Brawley to the north. SR-86 continues along the west side of the Salton Sea to serve the City of Westmorland and the Salton City area, and joins Interstate 10 at Indio in Riverside County. SR-111 serves the east side of the Salton Sea, through Calipatria and Bombay Beach/Hot Mineral Spa to also connect with I-10 in Indio. Both routes carry inter-regional commercial and agricultural traffic from Imperial County and Mexicali, Mexico to markets and transportation centers in Los Angeles and Orange County. These routes are also heavily used by recreational travellers to destinations in Imperial County, Baja California, and Arizona.

State Route 78 (SR-78) commences at I-10 at Blythe in Riverside County, traverses Imperial County in an east/west fashion through Palo Verde, Brawley, and Westmorland, and continues through San Diego's north county before terminating at I-5 in Oceanside.

Regional airline operations are provided to Imperial County Airport and Calexico International Airport. In addition, airports in Brawley and Calexico provide regional service. Railway freight operations use the Southern Pacific line from Riverside County along the east side of the Salton Sea



to Yuma and points east. The San Diego and Eastern Railroad has been non-operational through the Jacumba Mountains following Tropical Storm Kathleen in 1976. Work to re-open the line has not yet been completed.

**f. Education**

The County educational system is made up of eighteen school districts consisting of 37 elementary schools, 7 high schools, 6 adult schools, one community college (Imperial Valley College) and one satellite campus of San Diego State University. The Imperial County Office of Education serves as the intermediate unit between the school districts and the State Department of Education. Among the services provided are Special Education, Migrant Education, Youth Employment Services and the Regional Occupation Program.

**g. Health Care**

Imperial County has three hospitals located in the three major cities: Callexico Hospital in Callexico, El Centro Regional Medical Center in El Centro, and Pioneers Memorial Hospital located in Brawley. Each hospital provides varying degrees of health education information and programs. The Clinica de Salud del Pueblo, a primary health care clinic provides medical and dental service for lower income families with clinics in Brawley, Callexico, and Blythe.

The County Health Department provides community health education, outreach services to seniors, and children's immunization clinics. Imperial Valley Home Patient Care is a private agency providing a variety of home health services to Imperial County residents.

Imperial County Mental Health Services include out-patient counseling and a day treatment center. Acute involuntary mental health patients are transported to hospitals outside the County. Drug and alcohol education is also provided in the schools and various service clubs.

**6. Recreational Resources**

Imperial County's unique natural environment provides opportunities for numerous recreational activities and has made the County a destination for recreationists and nature lovers from Southern California and the nation. The mountains, desert, Salton Sea, and Colorado River lure tens of thousands of visitors annually. The warm winter climate attracts "snowbirds" who return each year to RV Parks and recreational communities.

Passive activities include hiking, rockhounding, bird watching, fishing, and relaxing in natural hot water springs; while more active pursuits include off-road vehicle use, water-skiing, golf, and tennis. With nearly one million acres managed locally by the federal Bureau of Land Management, many improved and primitive camping areas exist throughout the County. In particular, off-road vehicle activities in the Algodones Sand Hills attract over 50,000 people on several weekends each year to open use areas at Glamis, Gecko, Mammoth Wash, and Buttercup Valley. Other off-road vehicle areas include Ocotillo Wells Off-Highway Vehicle Park and the Heber Dunes.





## 7. Cultural Resources

In Imperial County most archeological work can be separated into two distinct sections: prehistoric and historic. Prehistoric archaeology deals with aboriginal culture and systems which existed prior to Spanish colonization in 1769. Historical archaeology deals with uncovering facts that no known historical documentation has provided.

Approximately 7,000 prehistoric sites have been recorded in Imperial County. A wide variety of site types are present including settlements, trails, rock art, intaglios, fish traps, and resource procurement and manufacturing locations. The current distribution and availability of such resources are a consequence of several environmental and historic factors. Environmental factors include the periodic flooding of ancient Lake Cahuilla and the existence of the New River and Alamo River, all of which encouraged prehistoric settlement and resource use in the vicinity of their shorelines and riverbanks.

Approximately 200 historic sites have also been recorded in the County. Important historic resources date back to 1540, when the Hernando de Alarcon Expedition discovered Alta California from near the intersection of Interstate 8 and Highway 186 on the Colorado River. The next major historical event occurred in 1775 when Juan Bautista de Anza first passed through the area. The Anza Trail itself constitutes a significant cultural resource in the Yuha Desert, as does the later Sonoran/Southern Emigrant Trail which served as a major route to and from coastal California from 1825 to 1865. Several historical markers have been established along the Anza Trail, including the monument of Los Puertecitos near Highway 78 and Kane Springs Road.

Two additional significant resources that stem from the Spanish period (1769-1821) are the La Purisma Conception Mission site, located at Mission St. Thomas on Indian Hill, and the San Pedro y San Pablo de Bicuñer Mission site, located near Laguna Dam. The former was constructed in 1780 at the request of the local Indians, and the latter in January 1781 as a strategic settlement for those crossing the Colorado River. Both were attacked and destroyed by the Quechans on July 17, 1781.

One of the few known historic sites from the Mexican period (1821-1848) is Fort Romualdo Pacheco. Located about seven miles west of Imperial near the New River, this fort was the only Mexican fort in Alta California, and was constructed to help maintain the Sonoran Trail. It was constructed in 1825 and attacked by the Kamia on April 26, 1826, resulting in the deaths of three soldiers and the fort's abandonment.

Few sites remain from the early American period (1848 through the early 1900s), since little settlement and other use occurred until the availability of irrigation water in 1901. One American period site has received a historical monument for being the location where the first irrigation water entered the County. This monument is located a few feet from the U.S.-Mexican border on Barbara Worth Road, between Calexico and the Alamo River.

Another significant historical site is the Plank Road near I-8 along the Algodones Sand Hills. Utilized from 1914 to 1927, this seven-mile long road had been dedicated as California Registered



Historical Landmark No. 845. Other site of local historical importance are described in *Imperial Valley Historical Markers* (Little 1982).

## **B. Governmental Structure**

### **1. Cities, Special Districts, and Private Utilities**

Imperial County is served by a variety of governmental organizations and a few private utility companies which play a role in local land use management and development. The seven incorporated cities within the County are Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland. Each jurisdiction has its own General Plan and each provides facilities for water and sewage treatment, police and fire services, and other governmental functions.

The unincorporated communities which also provide local services through single- or multi-purpose special districts are Bombay Beach, Heber, Niland, Ocotillo, Palo Verde, Seeley, Winterhaven, and the Salton City area. Services provided are usually limited to water treatment for domestic use, but may also include sewage treatment, fire protection, and park maintenance. For example, in Ocotillo only a volunteer fire department is provided by its District; in Palo Verde, only water treatment is provided; sewer and water treatment is provided in Heber and Seeley; and sewer, park maintenance, and management of a local golf course is provided in Salton City.

Private utility companies also operate in the County, the largest of which is Southern California Gas Company which serves Calipatria, Calexico, El Centro, Heber, Holtville, Imperial, Niland, Seeley, and Westmorland. Several private water companies provide domestic water in Ocotillo; and in Hot Mineral Spa sewage treatment is provided by individual mobilehome/RV parks.

### **2. Imperial Irrigation District**

Imperial Irrigation District (IID) is the principal regional agency in the County, in terms of services provided. Except in each of the four distant corners of the County, IID provides water for agriculture and to local cities and districts to treat for domestic use. It also distributes electrical power purchased from outside the County and from local hydroelectric and steam plants. Recently, it has been evaluating the possibility of building and operating sewage treatment plants.

### **3. Local Agency Formation Commission**

The Local Agency Formation Commission (LAFCO) is an intra-local agency that was created by state legislation and is designed to ensure that changes in governmental organization occur in a manner which provides efficient and quality services and preserves open space land resources. The creation of LAFCO was a legislative response to actions by local jurisdictions in the 1940's and 1950's that incorporated or annexed large, irregular portions of land in a manner which resulted in irrational urban boundaries and "stranded" some populated areas without efficient services or with no services at all. In 1963, the Legislature established Local Agency Formation Commissions in each county and gave them regulatory authority over local agency boundary changes. Additional legislation in the 1960's extended LAFCO authority, and in the 1970's the Legislature recognized the connection between decisions concerning governmental organization and the issues of urban





sprawl and loss of prime agricultural land. The Legislature and the courts have also required LAFCO agencies to implement the California Environmental Quality Act (CEQA) as it applies to LAFCO actions.

LAFCO is empowered to review, approve or disapprove incorporations and disincorporations of cities; special district formations and dissolutions; boundary changes of cities; special district annexations, consolidations, and reorganizations; and to establish local government "spheres of influence". The sphere of influence for each governmental agency is a plan for its ultimate boundary and service area. The LAFCO function is outlined in State of California, Government Code Section 56000 *et seq.*, known as the Cortese-Knox Local Government Reorganization Act of 1985.

The sphere of influence of each affected local agency is one of the many factors that LAFCO must consider when acting on a proposal for annexation or other boundary change pursuant to Government Code Section 56841(h). Every determination made by LAFCO regarding matters under its jurisdiction must be consistent with the spheres of influence of the local agencies affected by those determinations.

A copy of LAFCO's rules may be obtained from the Executive Officer, c/o the Imperial County Planning/Building Department.

#### **4. Airport Land Use Commission**

The basic purpose of an airport land use commission is to help ensure that proposed development in the vicinity of airports will be compatible with airport operations. The Imperial County Airport Land Use Commission (ALUC) is organized in the basic manner provided by state law -- two county representatives, two representatives of the cities in the county, two representatives of the airport managers, and one general public representative. Staff for the Commission is provided by the Imperial County Planning Department.

The Commission adopted the *Airport Land Use Compatibility Plan* June 5, 1991. The Plan sets forth the criteria and policies which the ALUC will use in assessing the compatibility between the principal airports in Imperial County and proposed land use development in the areas surrounding them. The emphasis of the Plan is on review of local general and specific plans, zoning ordinances, and other land use documents covering broad geographical areas. The Commission does not have authority over existing incompatible land uses or the operation of any airport.

The Plan specifically pertains to the land uses surrounding the following seven airports: Brawley Municipal Airport, Calexico International Airport, Calipatria Municipal Airport, Holtville Airport, Imperial County Airport, Salton Sea Airport, and the Naval Air Facility El Centro. Additionally, the Plan provides guidance for Commission review of new airports and heliports proposed for construction in the County.

#### **5. Air Pollution Control District**

Imperial County is located within the Southeast Desert Air Basin (SEDAB) covering the Imperial, Coachella and Antelope Valleys eastward to the California border. The Imperial County Air



Pollution Control District (APCD) was established in 1971. It has County-wide jurisdiction and is responsible for ensuring that the ambient air quality standards of the federal Clean Air Act and the California Clean Air Act are achieved and maintained. The state Air Resources Board (ARB) also shares this local responsibility and is solely responsible vehicular emission control.

Particulate matter originating from agricultural activities is the primary air quality concern in Imperial County. Air pollution monitoring stations controlled by APCD are located in Brawley, El Centro, and Calexico. These stations determine if the County is meeting the National Ambient Air Quality Standards (NAAQS). These standards are the levels of air quality necessary to protect the public health and welfare from any adverse effects with an adequate margin of safety.

## **C. Natural Environment**

### **1. Landform**

The Salton Trough, the most dominant landform within the County, comprises the northern landlocked portion of the Gulf of California and includes the Coachella, Imperial and Mexicali Valleys. The elevation of this broad alluvial plain ranges from 47 feet above sea level at the high point of the Colorado River Delta in Mexico to -275 feet below sea level near the Riverside County line. The lowest portion of the Trough is covered by the Salton Sea, California's largest inland body of water. The sea covers approximately 211,000 acres or 330 square miles, and was at its highest level in April, 1986 at -226 feet.

The complex geologic structure of the Salton Trough has been evolving for millions of years. It is a "rift" in the earth's crustal plates. The East Pacific Rise is the boundary between the Pacific and North American Plates. It extends up the Gulf of California by a series of "spreading centers" with strike slip faults. The thinning of the crust from the slow but continuous widening of the Salton Trough causes the earth's magma to rise closer to the surface and generate abnormally high heat flow which, in turn, heats deep groundwaters.

The irrigated portion of the County is roughly coincident with the shoreline of the ancient Lake Cahuilla and the sea level contour. Non-marine and alluvium sediments cover large portions of the area, especially at the base of the mountain ranges. The major drainage watershed of the County and northern Baja California into the Salton Sea covers 8,360 square miles. The valley has two natural waterways, the Alamo River and New River, which originate south of the border and flow northward to the Salton Sea. These waterways are historic channels which carried Colorado River water and/or stormwater at various times. Presently, the continuous flow into the Salton Sea is due to irrigation run-off.

The mountains are primarily extrusions of volcanic, granitic, igneous and metamorphic rock complexes and exhibit extensive faulting. These include the Santa Rosa, Fish Creek, Coyote, and Jacumba Mountains to the west; the Chocolate Mountains to the northeast; the Algodones Sand Hills, Picacho Peaks, and Cargo Muchacho Mountains to the southeast; and Palo Verde Peak to the northeast. The highest point in the County is 4,284 feet at Blue Angel Peak.





The Algodones Sand Hills are over 40 miles in length and five miles wide and are generally located between the eastern edge of the Imperial Valley agricultural region and the Southern Pacific Railroad. These sand dunes are the most extensive in California, rising to heights of over 300 feet above the surrounding desert floor.

## **2. Geology**

Several significant geologic hazards occur within Imperial County. Particularly noteworthy are seismic activity, flooding, and subsidence. Others include expansive soils and erosion. Detailed information on local geologic hazards can be found in the Seismic and Public Safety Element.

Most likely, some portion of Imperial County will be affected by a minor earthquake (less than Richter magnitude of 3.5 and causing little or no damage) every few months. Every five years, the County may experience a moderately damaging event (magnitude of 5.5 or greater). At least once every fifty years there will probably be a major earthquake (6.8 or greater). Microseismicity occurs almost continuously in Imperial County (events less than 2.0), often dozens and sometimes hundreds of events per day.

Subsidence has been naturally occurring throughout the Salton Trough. This natural subsidence averages nearly two inches per year at the center of the Salton Sea, yet decreases to zero near the Mexican border. The subsidence is generally uniform, but local depressions, such as the Mesquite Sink south of Brawley, have formed. Earthquakes have also caused abrupt elevation changes in excess of one foot across fault lines.

The geologically young, unconsolidated sediments of the Salton Trough are subject to failure during earthquakes, especially throughout the irrigated portion where it is generally saturated. Liquefaction and related loss of foundation support is a concern which requires appropriate structural design for new buildings.

Flooding is another geological hazard within the County. Floodplains are generally located adjacent to rivers and other bodies of water, and in low lying areas near a water source. These are areas that are predicted to experience inundation from storms having a frequency of once every one hundred years. Floodways are more hazardous due to the anticipated velocities of the flood waters and expected damage to life and property. Such designations occur along the New and Alamo Rivers; Myers Creek, which flows into an alluvial fan in the Ocotillo area; within the levees along the Colorado River; along the San Felipe Creek; and where numerous washes occur throughout the County.

Further information can be obtained by maps, reports, and studies on file with the County Planning Department including Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Management Agency, the Alquist-Priolo Special Studies Zones maps of local earthquake faults prepared by the State Geologist, the County General Plan Conservation and Open Space Element, and the Seismic and Public Safety Element.



### 3. Climate and Air Quality

Imperial County has an arid climate with hot, dry summers and mild winters. The climatic condition of the area is governed by large-scale warming and sinking of air in the semi-permanent subtropical high pressure center over the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms except in the winter when the high ridge is weakest and farthest south. Also, the coastal mountains prevent the intrusion of the cool, damp air found in the California coastal regions.

The flat terrain and strong temperature differentials created by intense heating and cooling patterns produce moderate winds and deep thermal circulation systems. Thus, even though the summers are hot, the general dispersion of local air pollution is greater than in the coastal basins where polluted inversion layers may remain for long periods.

The daily temperatures and seasonal variations can be extreme. The clear skies and rapid heating and cooling of the desert soils create high temperatures by day and quick cooling by night. The average annual rainfall is about 3 inches, the average annual air temperature is about 72 degrees Fahrenheit, and the average frost-free season is about 300 days per year.

The local air quality levels are currently better than most state standards. In the last two years, the County has not exceeded the federal ozone standard of 0.12 parts per million (ppm); however, particulate matter concentrations do not meet either state or federal standards. This failure is due to natural conditions such as wind blown sand and dust, and man made conditions such as agricultural burning of fields.

### 4. Soils

The soils of Imperial Valley consist of silty clays, silty clay loams, and clay loams that have formed on nearly level old lake beds and floodplain deposits. The soils are generally deep, high calcareous, and usually contain gypsum and soluble salts. The central part of the County, which is irrigated, generally has fine textured silts. Sandy soils predominate in higher areas, such as the East and West Mesas, and are typical of most of the deserts in the southwestern United States. These soils do not have well defined horizons and are several thousand feet deep.

In the dry climate of Imperial County, the soils have no potential for farming and only limited potential for wildlife habitat unless they are irrigated. The federal Soil Conservation Service's Soil Survey is a detailed inventory and evaluation of Imperial County soils (see Conservation and Open Space Element of the General Plan). Information derived from the Soil Survey publication may be useful in planning the use and management of soils for crops and pastures, as sites for buildings, highways, and other transportation systems, sanitary facilities, parks and other recreational facilities, and for wildlife habitats. From this data, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable may be selected, and measures to overcome soil limitations can be planned.





## 5. Water Resources

The source of virtually all surface waters in Imperial County is the Colorado River. The water is diverted from the Colorado River at the Palo Verde Weir north of Blythe by the Palo Verde Irrigation District for use in the Palo Verde Valley of northeast Imperial County and southeast Riverside County; and at the Imperial Dam into the All-American Canal by the Imperial Irrigation District (IID) and the Bard Irrigation District for use in the Imperial, Yuma, Bard, and Coachella Valleys. The 82-mile All-American Canal, the three-mile New Briar Canal, and 52 miles of drains are owned by the Bureau of Reclamation and are operated and maintained by IID.

The District also owns and operates a 1,590-mile network of main canals and laterals and 1,406 miles of main and lateral drains to serve approximately 500,000 acres of irrigated farm land. Water is also provided by IID to cities and special districts throughout the County which treat and distribute the water for urban uses.

## 6. Biological Resources

**Plants.** As part of the lower Colorado River Basin, much of the County has historically been a creosote bush (*Larrea divaricata*) plant community. With agriculture as the dominant activity since the early 20th Century, the constant clearing of the valley floor for farming has destroyed much of the native plant life. Remnants of natural plant communities exist along the Alamo and New Rivers, along the watershed boundaries of the surrounding mountains, and at the edge of the Salton Sea.

The plant species are predominantly those which are salt tolerant: saltbush (*Atriplex canescens* spp.), iodine bush (*Allenrolfea occidentalis*), tamarisk (*Tamarix* sp.), mesquite (*Prosopis juliflora*), arrow weed (*Pluchea sericea*), sea blight (*Suaeda* sp.), and other halophytes (salt tolerant plants).

The Conservation and Open Space Element of the County General Plan has a map indicating where sensitive plant species are located. Another source which lists the rare, threatened and endangered plant species is the Bureau of Land Management's "California Desert Conservation Area Plan (1980)." Within this federal Plan, plants are protected through the designation of Areas of Critical Environmental Concern (ACEC).

**Animals.** Natural desert wildlife populations can be found throughout the County, but mainly are concentrated in areas where there is limited agricultural disturbance due to plowing, planting, and the harvesting of crops. The natural desert environment surrounds the irrigated portion of the valley and also occurs as scattered patches within the farm lands. With two rivers and hundreds of miles of irrigation canals and drainage ditches, the abundant water supply creates pockets of riparian habitat where non-desert animal life exists.

Imperial County is located on one of the most important flyway corridors for migrant waterfowl, shorebirds, and songbirds. Generally, the greatest numbers and diversity of birds are found during the autumn and spring months. The presence of the Salton Sea, rivers, canals, drainage ditches, and fish farms are a strong attraction to bird species for food sources, nesting and resting sites. Refuges and management areas created by the California Department of Fish and Game and U. S. Fish and Wildlife Service also attract various mammals, bird species, reptiles, and amphibians.



## 7. Geothermal Resources

Generally, temperatures gradually increase with depth below the surface of the earth. Areas where increased temperatures are significantly higher are referred to as "geothermal anomalies". These anomalies may be caused by one or a combination of the following:

- Thinning of the earth's crust or volcanic activity bringing the hot magma of earth's interior closer to the surface.
- Chemical or mechanical activities deep in the crust itself which generate heat.
- Insulating layers in the rock and soil which confine the earth's heat so that temperatures build up.

If no water is present, the anomaly is called "hot dry rock". A few geothermal anomalies produce steam, such as the Geysers in Northern California. However, most water-dominated anomalies, like Imperial Valley, have hot fluids. Fifteen percent of the heat is contained in the fluids; the remaining eighty-five percent is in the rock itself.

The California Division of Mines and Geology recognizes the Salton Trough as an area underlain at shallow depths by thermal water of sufficient temperature for direct heat application. Separate anomalies are distributed throughout the Trough and have hotter fluids that are suitable for electrical generation. The percentage of dissolved salts in the hot water is extremely high which has resulted in the saline corrosion of equipment from use of this brine. Recent large scale development of geothermal resources has resulted from the ability to engineer cost-effective technology which overcomes technical problems and makes geothermal development economically feasible.

Although the entire Salton Trough is an anomaly, certain "hot spots" exist. Slow convection currents in the reservoir have developed, with the hotter fluids rising in some places, cooling near the surface, spreading out and descending in other places. Also, and perhaps most significantly, at various locations some of the sedimentary layers act as blankets preventing the heat from reaching the surface and escaping into the atmosphere. Clays, impermeable to water, and volcanic tuffs, for example, provide these confining insulating layers. Local hot spots are the Salton Sea, Heber, East Mesa and Brawley. Imperial Valley generally, and the Salton Sea anomaly in particular, may be the largest geothermal resource in the world. For this reason, the County General Plan includes the Geothermal and Transmission Element in order to provide information and policy to guide local development of this unique resource.





## APPENDIX A

### LIST OF ORGANIZATIONS AND PERSONS CONSULTED

The following organizations and persons were consulted in the preparation of the Imperial County General Plan, including the 1993 Update:

#### Local:

Airport Land Use Commission  
Bombay Beach Community Service District  
Brawley School District  
Brawley Union School High School District  
Brawley, City of  
Brawley, City of, Library  
Calexico Unified School District  
Calexico, City of, Planning Department  
Calexico, City of, Library  
Calipatria Unified School District  
Calipatria, City of  
Central High School District  
County of Imperial, Airport/Real Property, Dan Pavao, Manager  
County of Imperial, Assessors Office, Jose Rodriguez  
County of Imperial, Building Board of Appeals, Chairman  
County of Imperial, Buildings and Grounds Department/Parks and Recreation Department, Randy Rister  
County of Imperial, County Counsel Office, Joanne Yeager, Assistant County Counsel  
County of Imperial, Department of Health Services, Environmental Health Services, Tom Wolf  
County of Imperial, Department of Public Works, S. Harry Orfanos, Director  
County of Imperial, Fire Department/Office of Emergency Services, Nicanor Benavidez, Chief  
County of Imperial, Library, Berita Fulmer  
County of Imperial, Office of Education  
County of Imperial, Office of the Agricultural Commissioner, Steve Birdsall  
Coyote Valley Mutual Water Company  
El Centro School District  
El Centro, City of, Planning Department  
El Centro, City of, Library  
Farm Bureau  
Heber Public Utilities District  
Heber School District  
Holtville Unified School District  
Holtville, City of  
Imperial County Association of Realtors  
Imperial Irrigation District, Charles L. Shreves, Manager



Imperial Irrigation District, Chairman, Board of Directors  
 Imperial Irrigation District, Water Department, Jesse Silva  
 Imperial Irrigation District, Power Department, Hank Legaspi  
 Imperial Unified School District  
 Imperial Valley College Museum, Jay C. Von Werlhoff, Archaeologist  
 Imperial Valley College, Hector Lopez, Ph.D.,  
 Imperial, City of  
 Kiwanis Early Risers Club of El Centro  
 Local Agency Formation Commission, Chairman  
 Magnolia Union School District  
 McCabe Union School District  
 Meadows Union School District  
 Mulberry School District  
 Niland Chamber of Commerce  
 Ocotillo Community Council  
 Ocotillo Mutual Water Company  
 Palo Verde Homeowners Association  
 Regional Economic Development, Inc.  
 Rotary Club of El Centro  
 Salton Community Services District  
 Salton Sea Fish and Wildlife Club  
 San Diego State University, Imperial Valley Campus  
 San Pasqual Valley Unified School District  
 Seeley County Water District  
 Seeley Union School District  
 The Great Salton Sea Experience  
 Westmorland Union School District  
 Westmorland, City of  
 Winterhaven County Water District

**State:**

State of California, Office of the Governor, Office of Local Government Affairs, Antero A. Rivasplata, Principal Planner  
 State of California, Caltrans, District 11, Bob Corbin, Civil Engineer  
 State of California, Department of Conservation, Division of Mines and Geology/Farmland Mapping and Monitoring Program  
 State of California, Department of Corrections, Planning and Construction Division,  
 State of California, Department of Finance, Population Research Unit  
 State of California, Department of Fish and Game, John Thompson, Wildlife Biologist  
 State of California, Department of Fish and Game, Kimberly Nicol, Fishery Biologist  
 State of California, Department of Fish and Game, Ronald E. Powell, Wildlife Manager Biologist  
 State of California, Department of Health Services, Office of Noise Control  
 State of California, Department of Resources, State Mining and Geology Board  
 State of California, Employment Development Department, Employment Data and Research  
 State of California, Regional Water Quality Control Board, Colorado River Basin





State of California, State Lands Commission

**Federal:**

Bureau of Indian Affairs  
Quechan Indian Tribe  
Torres-Martinez Indian Reservation  
U.S. Army Corps of Engineers  
U.S. Customs Service  
U.S. Department of Agriculture, Soil Conservation Service  
U.S. Department of Commerce, Bureau of the Census  
U.S. Department of the Interior, Bureau of Land Management, El Centro Resource Area  
U.S. Department of the Interior, Bureau of Reclamation  
U.S. Fish and Wildlife Service, Calipatria  
U.S. Marine Corps Air Station, Yuma  
U.S. Naval Air Facility, El Centro

**Regional:**

AT&T  
Coachella School District  
Coachella Valley Water District  
Pacific Bell  
Palo Verde Water District  
Riverside, County of, Planning Department  
San Diego Gas and Electric, San Diego  
San Diego, County of, Planning Department  
Southern California Association of Governments  
Southern California Edison  
Southern California Gas Company  
Yuma, City of  
Yuma, County of  
Yuma Valley Water District





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land use element

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## **IMPERIAL COUNTY GENERAL PLAN LAND USE ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

As required under California Government Code Section 65302(a) this document represents Imperial County's amended Land Use Plan. This Land Use Element shall serve as a guide to the decision makers, staff and the public to address the distribution, general location and extent of uses of land for housing, business, industry, open space, agriculture, and public facilities. This Land Use Element amends and updates the current Ultimate Land Use Plan adopted on June 25, 1973, along with Current Land Use Plans adopted thereafter and amendments thereto.

The Land Use Element describes existing land uses within the County and the facilities and services which provide the public infrastructure to support these uses. Also stated are Goals and Objectives for future growth, expansion of public facilities, and environmental resource protection; and policies and programs to guide such future growth. A Land Use Plan delineates, at a scale of 1 inch = 2 miles, County areas designated within nine land use categories. A copy of the Land Use Plan is available at the County Planning/Building Department.

#### **B. Purpose of the Land Use Element**

The primary purpose of the Land Use Element is to identify the goals, policies and standards of the General Plan that will guide the physical growth of Imperial County, including the public facilities necessary to support such growth. It is prepared pursuant to Government Code Section 65302(a) which reads as follows:

A land use element which designates the proposed general distribution and general location and extent of the uses of the land for housing, business, industry, open space, including agriculture, natural resources, recreation and enjoyment of scenic beauty, education, public buildings and grounds, solid and liquid waste disposal facilities, and other categories of public and private uses of land. The land use element shall include a statement of the standards of population density and building intensity recommended for the various districts and other territory covered by the plan. The land use element shall identify areas covered by the plan which are subject to flooding and shall be reviewed annually with respect to those areas....

This Element, therefore, is to show in a very general way a range of uses for lands within the County, without projecting when or how a use will be developed. The General Plan and this Element is based in part on a statement of the purpose of Government and Government Plans and on five basic goals adopted by the Board of Supervisors on January 2, 1973. The purpose of Government and, therefore, Government Plans is to help every citizen to secure a better life than would be possible without the efforts of Government in their behalf.



The five basic concepts adopted by the Board in support of the General Plan are:

- Safety for people and property.
- Wide selection of social and economic opportunities.
- Efficient use of natural, human and financial resources.
- Clean air, water and land.
- Quiet, beautiful communities and rural areas.

The intent of the California legislature was and is to provide effective and efficient land uses in an orderly and well planned manner. In keeping with this intent, the County shall use this plan to guide its development and to plan for necessary improvements for public facilities and services.

The intent of the County of Imperial in preparing the Land Use Element is to maintain and promote the economic prominence of agricultural enterprises, determine appropriate urban development centers and encourage their economic development, protect the existing character of rural and recreational communities and areas, and preserve the unique natural and cultural resources of the Imperial Valley region.

### **C. Urban Areas and Community Areas**

Urban Areas and Community Areas are General Plan designations which provide for a range of permitted land uses within specific geographic areas of the County. Prior to this General Plan Update there were nine adopted Current Land Use Plans: Bard/Winterhaven, Brawley, Calexico, El Centro, Heber, Holtville, Palo Verde, Seeley, and Yuha Desert. The Brawley, Calexico, El Centro and Holtville plans cover a limited area outside the incorporated area of the cities. The Bard/Winterhaven, Heber, Palo Verde, Seeley, and Yuha Desert plans addressed not only the townsites but surrounding areas as well.

For urbanizing areas surrounding incorporated cities, the existing Current Land Use Plans duplicated the land use planning efforts of the cities and, at times, conflicted with them. Implementation of this Update is intended to include zone reclassification studies for areas adjacent to cities which will be based on the adopted Land Use Plan of each city. County zoning would be changed to reflect residential densities and land use intensities which are at or below that which would be permitted by the city Land Use Plan. For the "urban" unincorporated areas of Heber, Niland, Salton City, Seeley, West Shores and Winterhaven new Current Land Use Plans will need to be prepared. Zoning techniques may also be recommended which would limit development where public facilities are presently inadequate to provide an urban level of service; or where premature development would impact continued agricultural use of adjacent property or cause "leapfrog" or "checkerboard" land use patterns.





# LAND USE PLAN

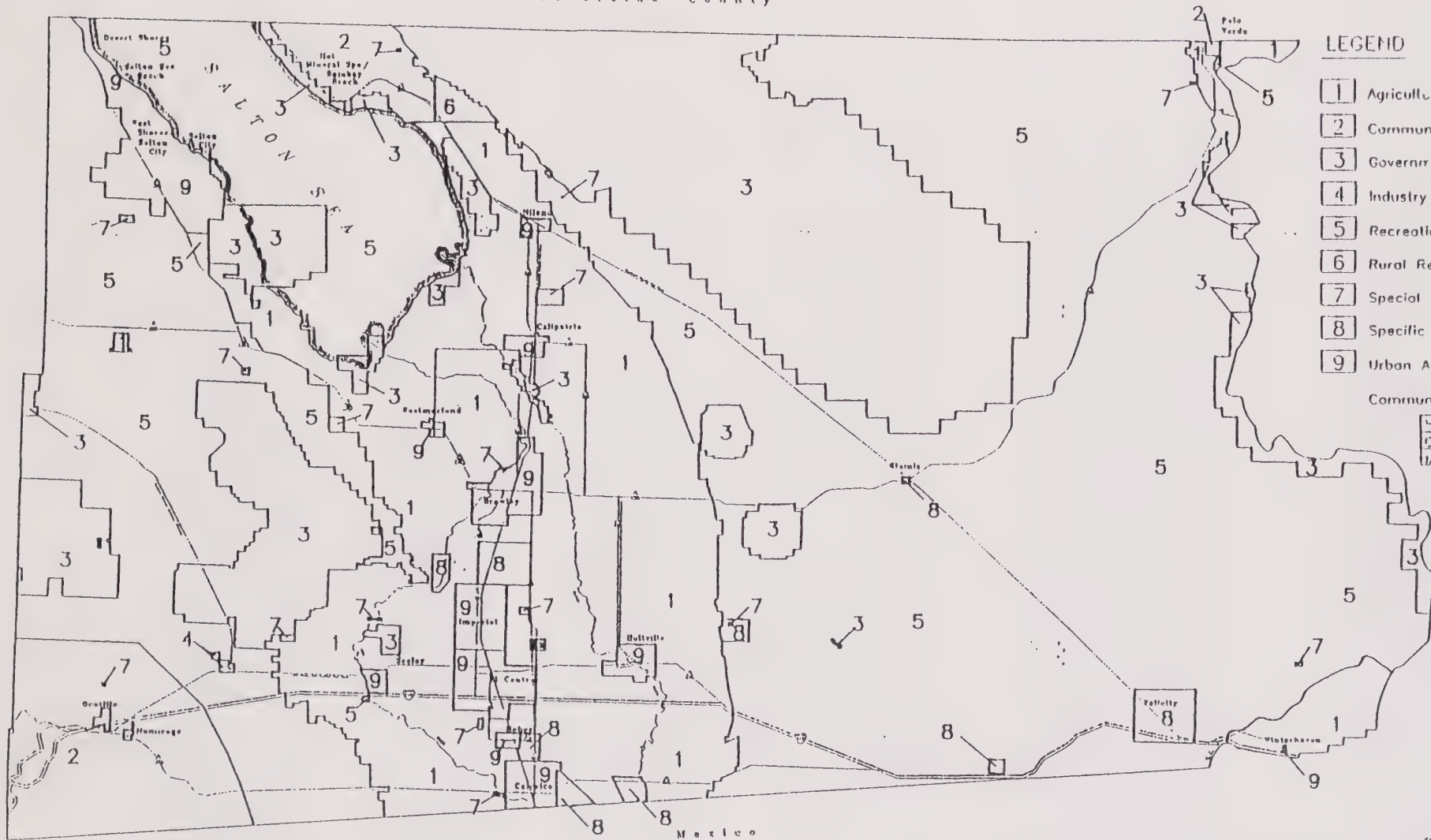
Riverside County

## LEGEND

- 1 Agriculture
- 2 Community Area
- 3 Government/Special Public
- 4 Industry
- 5 Recreation/Open Space
- 6 Rural Residential
- 7 Special Purpose Facility
- 8 Specific Plan Area
- 9 Urban Area

### Community Facilities

- H Hospital
- C College
- M Museum



### BOARD OF SUPERVISORS

District 1  
District 2  
District 3  
District 4  
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District 7  
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District 9  
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### DATE OF ADOPTION

Adopted by the Board of Supervisors on  
Resolution No. \_\_\_\_\_ Date \_\_\_\_\_  
Date of the Board  
Year of the Board

CONSENT PLAN TO THE BOARD OF SUPERVISORS  
UNIVERSAL COUNTY  
DISTRICTS



San Diego County



Where previously adopted Current Land Use Plans exist, these Plans shall remain in full force and effect until rescinded, superseded, or amended pursuant to a General Plan Amendment with accompanying environmental review. Land development proposals for these areas shall continue to be guided by existing zoning and, when a discretionary land use decision or environmental analysis is required, by the adopted Current Land Use Plans and an evaluation for conformance to this General Plan Update.

## 1. Urban Areas

The Urban Area designation on the Land Use Plan includes the previously adopted Brawley, El Centro, Heber, Holtville, Seeley, and Calexico Current Land Use Plans; the Winterhaven portion of the Bard/Winterhaven Current Land Use Plan; and the previously proposed Imperial Current Land Use Plan. Urban Area is also proposed adjacent to the cities of Calipatria and Westmorland, and for the unincorporated communities of Niland and West Shores/Salton City. These areas are characterized by a full level of urban services, in particular public water and sewer systems, and contain or propose a broad range of residential, commercial, and industrial uses.

It is anticipated that these areas will eventually be annexed or incorporated and should be provided with the full range of public infrastructure normally associated with cities. Therefore, development in these areas shall provide for the extension of full urban services such as public sewer and water, drainage improvements, street lights, fire hydrants, and fully improved paved streets with curbs and, in many cases, sidewalks. If located within an urban area, such improvements shall be consistent with City standards as determined by the City Engineer, Department of Public Works, Fire Marshal, and Planning/Building Department.

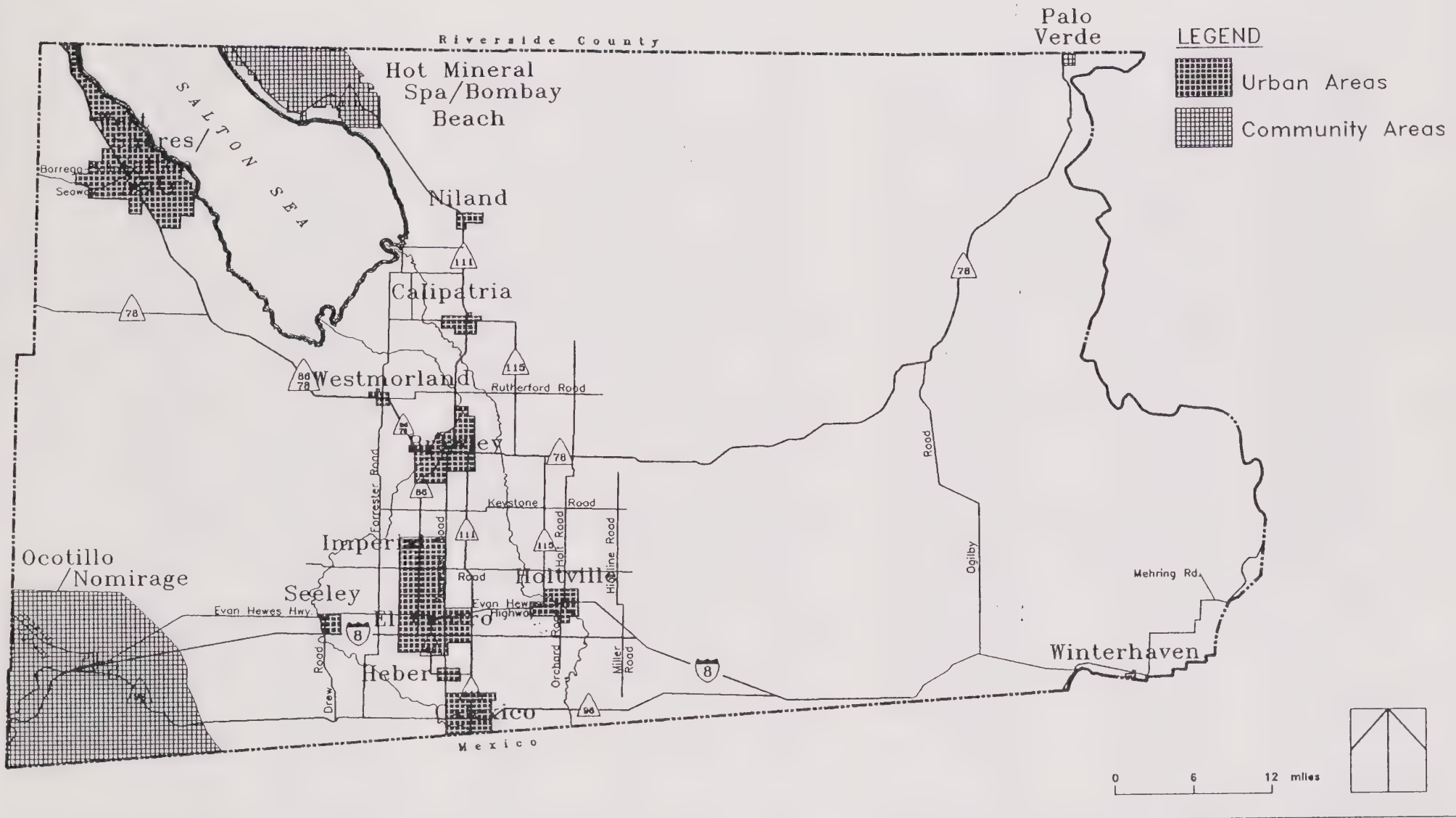
**Brawley Urban Area** - This (approximately) 9,890 acre area surrounds the incorporated City of Brawley and is generally bounded on the west by the New River, Brandt Road, Kalin Road, Poe Subdivision and State Highway 86, on the north by Ward Road, on the east by Best Road, the Livesely Drain, and a line approximately one-half mile east of Best Road, and on the south by the Rockwood Canal, Mead Road, the Best Canal, Dogwood Road, and Shartz Road.

**Calexico Urban Area** - This (approximately) 6,980 acre area surrounds the incorporated City of Calexico, with the City of Mexicali, Republic of Mexico, located to the south. The Planning Area is generally bounded on the west by Dogwood Road, on the north by Willoughby Road and Jasper Road, and on the east by Bowker Road and the designated S.P.A.

**Calipatria Urban Area** - This (approximately) 2,880 acre area surrounds the incorporated City of Calipatria and is generally bounded on the west by Lyerly Road, Bowles Road, Coberly Road, and English Road, on the north by Young Road with an northerly extension to Wilkenson between Coberly and Carrick Roads, on the east by Blair Road and Carrick Road, and on the south by Yocum Road and Bowles Road.







Imperial County  
General Plan

Urban and Community Areas

Land Use Element

Figure  
1



**El Centro Urban Area** - This (approximately) 12,800 acre area surrounds the incorporated City of El Centro and is generally bounded on the west by Austin Road, on the north by the Central Drain, Dogwood Road, and Villa Road, on the east by State Highway 111, and on the south by Northrup Road (extension), McCabe Road, a line approximately 1,320 feet east of Dogwood Road, and Chick Road.

**Heber Urban Area** - This (approximately) 960 acre area surrounds the unincorporated community of Heber and is served by the Heber Public Utilities District. It is located south of Interstate 8 between the cities of El Centro and Calexico bounded by Farnsworth Lane on the west, Correll Road on the north, Pitzer Road on the east, and Fawcett Road on the south.

**Holtville Urban Area** - This (approximately) 4,080 acre area surrounds the incorporated City of Holtville. It is bounded on the west by State Highway 115, Zends Road, and Country Club Road, on the north by Kamm Road, on the east by Towland Road, and on the south by Haven Road, the Ash Main Canal, and Edwards Road for a distance of approximately 3,300 feet east of Orchard Road, thence north to a line 1,320 feet south of Haven Road then east 3,660 feet then north to Haven Road and east to Towland Road.

**Imperial Urban Area** - This (approximately) 8,480 acre area surrounds the incorporated City of Imperial. It is bounded on the west by Austin Road, on the north by Ralph Road, on the east by Dogwood Road, and on the south by the Central Drain.

**Niland Urban Area** - This (approximately) 1,290 acre area surrounds the unincorporated community of Niland and is bounded on the west by Nieto Road, on the north by the railroad tracks, and the north line of which is approximately 1,000 feet north of Beal Road, on the east by the extensions of Cuff Road and Memphis Avenue, and on the south by the Noffsinger and Alcott Roads.

**Seeley Urban Area** - This (approximately) 1,520 acre area surrounds the unincorporated community of Seeley, located west of the City of El Centro and south of the Naval Air Facility. It is bounded on the west by the New River, on the north by El Centro Street, on the east by Bennett Road, and on the south by Interstate 8.

**Westmorland Urban Area** - This (approximately) 880 acre area surrounds the incorporated City of Westmorland. It is bounded on the west by Kingsley Road, State Highway 78/86, and Martin Road, on the north by Howenstein Road with a northerly extension between Martin Road and the railroad tracks for a distance of approximately 1,320 feet, on the east by Dean Road, and on the south by Baughman Road.

**West Shores/Salton City Urban Area** - This large unincorporated area encompasses approximately 31,840 acres and includes the developing community of Salton City, the beach resorts of Vista Del Mar, Salton Sea Beach, and Desert Shores, and the proposed Habitat 2000 Specific Plan Area. The Riverside County Line is the north boundary and





Salton Sea is the east boundary. The Navy's Salton Sea Test Base generally forms the southern boundary; and State Highway 86 generally forms the west boundary, except for portions of Salton City which extend west of Highway 86. Portions of the Torres-Martinez Indian Reservation are located in the northern portion of the Urban Area.

**Winterhaven Urban Area** - This (approximately) 200 acre area consists of the Townsite of Winterhaven and surrounding areas, and is situated in the most southeastern section of Imperial County. The Indian Reservation surrounds the north, east and west boundaries. The north boundaries are Blocks 1 and 2 situated north of H Street and Block 13 situated north of D Street, the east boundary is First Avenue, the south boundary is the Colorado River, and the west boundaries are Third Avenue Townsite of Winterhaven and the east line of the west half of the Southwest Quarter of Section 27 Township 16 South - Range 22 East.

The actual boundaries of the Urban Areas are graphically depicted on the Land Use Plan enlargements referenced as LU-1X, LU-2X, and LU-3X which are adopted as an integral part of this General Plan, and which are on file in the Planning/Building Department.

## **2. Community Areas**

The Community Areas are also shown on Figure 1 and updated Community Area Plans are proposed to be prepared for the Palo Verde Current Land Use Plan and portions of the previous Yuha Desert Current Land Use Plan (adopted March 20, 1973) which has been renamed the "Ocotillo/Nomirage Community Plan". The Hot Mineral Spa/Bombay Beach Community Area is intended to be guided by existing zoning for Bombay Beach, the Bombay Beach Specific Plan, and the (1965) Hot Mineral Spa General Plan.

Community Areas differ from Urban Areas in that they are primarily second home, retirement, or recreation areas with limited commercial or employment opportunities. Urban services, including sewer and water, are limited. Ocotillo/Nomirage is provided water service by private water companies and individual wells; Palo Verde by the Palo Verde County Water District; and Hot Mineral Spa/Bombay Beach by the Coachella Valley Water District. Only Bombay Beach has a public sewage system, also operated by the Coachella Valley Water District. The others rely on subsurface septic systems or facilities operated by mobilehome and RV parks.

Future growth in Ocotillo/Nomirage and Palo Verde is expected to consist primarily of infill by single family residences on existing lots, rather than expansion of community boundaries, except at very low densities. A planned expansion of Bombay Beach was approved in 1985 but has not been constructed. Development of Hot Mineral Spa is guided by the Hot Mineral Spa General Plan which forecasts a diverse community which may eventually accommodate a population of up to 75,000 persons for which expansion of presently limited public infrastructure will be required.

**Ocotillo/Nomirage Community Area** - This area encompasses the entire Ocotillo-Coyote Wells groundwater basin consisting of approximately 108,000 acres, of which





approximately 15,000 acres are privately held. The Community Area Plan focuses primarily on the desert residential communities of Ocotillo, containing approximately 465 acres, and Nomirage, containing approximately 225 acres, and also includes the small residential community of Yuha Estates located on Highway 98 approximately 5 miles east of Nomirage. The Ocotillo townsite is bounded on the west by Shell Canyon and the tract boundary west of Via De Anza, on the north by the tract boundary north of the Imperial Highway, on the east by Boundary Avenue, and on the south by Interstate 8 and an area extending south along both sides of the Imperial Highway approximately 1,320 feet. The Nomirage townsite is bounded on the west by Sage Road, on the north by Cholla Road and follows the tract boundary north along Palo Verde, Tamarack, and Molitar Roads, on the east by Molitar, Yucca, and Palo Verde Roads, and on the south by Saguaro Road. Interstate 8, State Highway 98, the Evan Hewes Highway, and Imperial Highway (S2) are the major transportation routes through the area. A County Sheriff's substation, volunteer fire department, and community center are located on Imperial Highway in Ocotillo.

**Palo Verde Community Area Plan** - This 640 acre area is located in the most northeastern corner of Imperial County, with Riverside County to the north, and is comprised of Section 2, Township 9 South, Range 1 East. Ben Hulse Highway (State Highway 78) runs north-south through the area. The town's role is primarily as a commercial center serving travelers on Highway 78, the surrounding agricultural and rural areas, Colorado River mobilehome and RV parks, and a small local population. Though it has a water filtration plant operated by a County Water District, Palo Verde's potential for growth of new employment opportunities is limited due to its remote location and the lack of a community sewerage system. Community facilities include a fire station, post office, community hall, church, and a rod and gun club.

**Hot Mineral Spa/Bombay Beach Community Area** - This 4,500-acre community, located on the east shore of the Salton Sea, is bounded by Riverside County on the north, Salton Sea State Recreation Area on the west, Coachella Canal on the east, and on the south by the Salton Sea State Recreation Area and the boundary between Townships 9 South and 10 South. Hot Mineral Spa is the area north of Highway 111 and is primarily occupied by mobilehome and recreational vehicle spaces in four existing parks. These parks also include some self-contained camping spaces. The total permitted spaces for these parks in 1992 was 1,460. Other housing exists throughout Hot Mineral Spa on individual lots, typically 2-1/2 acres and larger in size.

The Bombay Beach community is located on the Salton Sea and contains approximately 500 dwelling units on 704 buildable residential lots. An additional 280 units are proposed by the approved (1985) Bombay Beach Specific Plan between the existing development and Highway 111. The rising water level of Salton Sea has inundated an additional 240 lots located south of 5th Street.

Because limited potable groundwater is available in this area, the Coachella Valley Water District (CVWD) provides water service to the Hot Mineral Spa trailer parks, to Bombay



Beach, and to most of the single residences in the area. Some residences, however, depend on bottled water. Sewer service is provided to Bombay Beach by CVWD which operates a treatment plant on the north side of Highway 111 and the railroad line. Adequate area exists for expansion of the sewage treatment plant to eventually serve Hot Mineral Spa in the future. Presently, the mobilehome and RV parks in Hot Mineral Spa rely on either oxidation ponds or common septic systems for park residents. Individual residences rely on septic systems. Bombay Beach also has community management and maintenance services provided by the Bombay Beach Community Services District.

## **D. Specific Plans**

### **1. Purpose and Content**

Specific Plans are "planning tools" used to implement the general plan for large development projects such as a planned community, or to designate an area of the County where further studies are needed prior to development. Specific Plans should be utilized where existing conventional zoning regulations do not provide adequate controls over land use and development. Upon adoption, the Specific Plan serves as an amendment to the County General Plan for a very defined and detailed area. To be adequate, a Specific Plan must also be consistent with all aspects of the General Plan.

Specific Plans may be adopted by Resolution of the County Board of Supervisors. Following adoption of the Specific Plan, all subsequent use or development of the property shall be in conformance with the Specific Plan. The required contents of Specific Plans are set forth in the California Government Code, Section 65451, as follows:

- (a) A text and/or diagram which specify all of the following in detail:
  - (1) The distribution, location, and extent of the uses of land, including open space, within the area covered by the plan.
  - (2) The proposed distribution, location, and extent and intensity of major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan.
  - (3) Standards and criteria by which development will proceed, and standards for the conservation, development, and utilization of natural resources, where applicable.
  - (4) A program of implementation measures including regulations, programs, public works projects, and financing measures necessary to carry out paragraphs (1), (2), and (3).





- (b) The Specific Plan shall include a statement of the relationship of the Specific Plan to the County General Plan.

## **2. Standards and Criteria for Approval**

Specific Plans often represent significant investment of staff time to process the project, as well as County and local agency resources to support planned new growth. In order to justify this commitment of resources, proposed Specific Plans shall be required to clearly demonstrate fiscal, economic, social, public facility, or other local public benefit. The following Standards and Criteria shall be evaluated for each proposed Specific Plan during a "Specific Plan Pre-Application Assessment" with recommended findings presented to the Board of Supervisors by the Planning/Building Department and Planning Commission. In order to adopt a Specific Plan, the Board of Supervisors shall consider the findings of the following five criteria:

- (a) Will the Specific Plan have a positive fiscal impact for the County of Imperial?

An acceptable project will be able to demonstrate through an independent fiscal impact analysis and public facility financing study that revenue from property tax, sales tax, hotel room tax, and required fees, exactions, and assessments, will fully offset the cost of providing public services and infrastructure, including County administrative facilities, libraries, parks, roads, drainage, schools, wastewater collection and treatment, water treatment and distribution, fire protection, and police services.

- (b) Will the Specific Plan create new and permanent jobs?

An acceptable project will be able to demonstrate through an independent market analysis that jobs to be created by the project will not be achieved to the detriment of existing jobs or businesses within the County. In other words, there will be a net increase in County-wide employment.

- (c) Will the Specific Plan minimize or mitigate adverse environmental impacts and be compatible with existing or planned land uses of nearby cities or communities?

An acceptable project will be able to demonstrate feasible mitigation for all potential environmental and land use impacts of the project.

- (d) Will the Specific Plan offer diverse or unique opportunities to the County and its citizens?

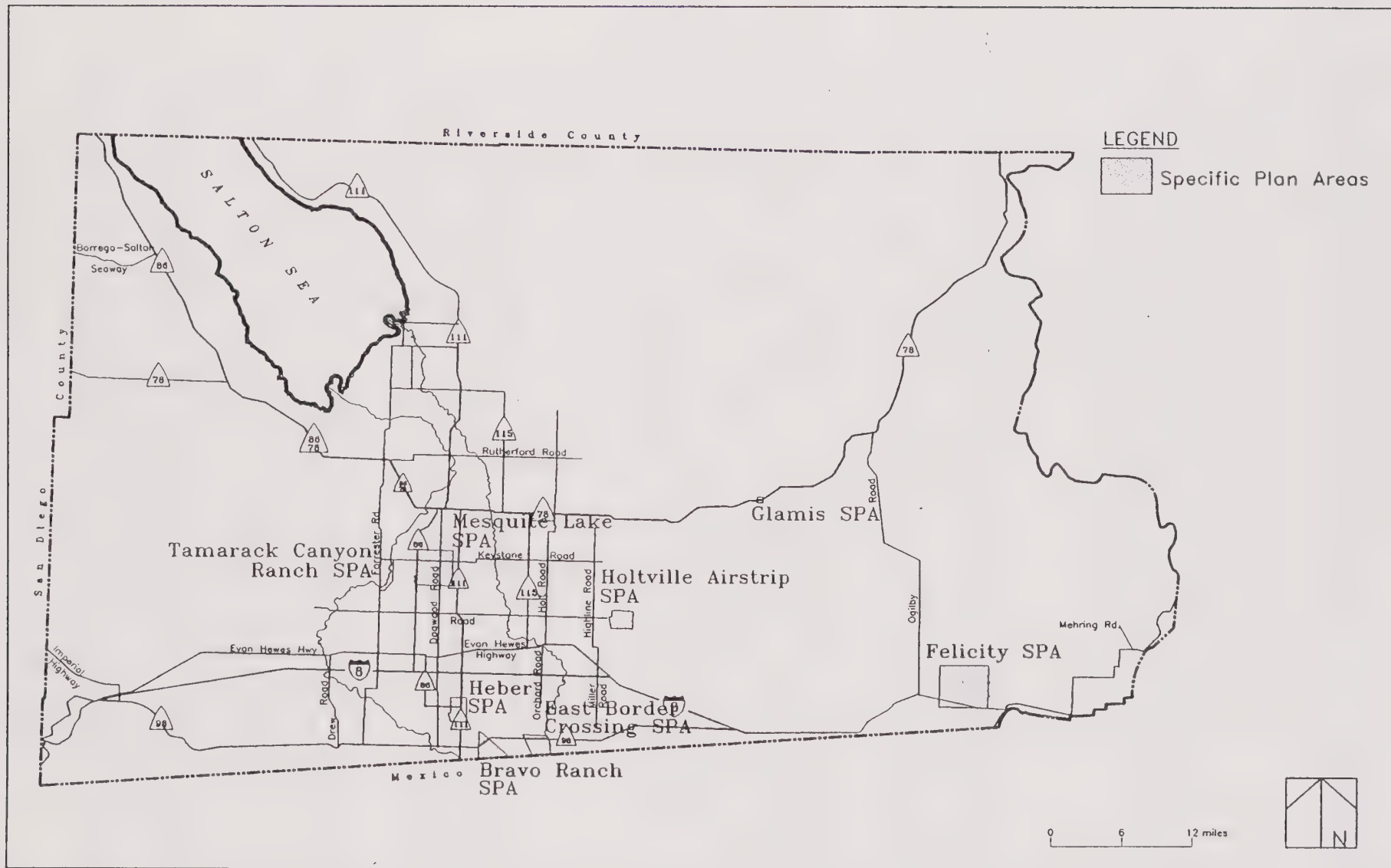
An acceptable project will be able to demonstrate benefits of the project which are not generally or adequately available in the County. Examples include, but are not limited to, increased cultural activities, convention or conference facilities, or unique recreational opportunities.



- (e) Will the Specific Plan result in the achievement or significant progress toward accomplishing an unmet goal of the County General Plan?

An acceptable project will be able to demonstrate that the achievement of a goal of the County General Plan or one of its Elements, which is not currently being adequately met, will be substantially advanced as a result of the proposed project.





Imperial County  
General Plan

Specific Plan Areas

Land Use Element

Figure  
2





In addition to the above findings, if the proposed Specific Plan is less than 640 acres in size, a finding shall also be made that the proposed project will provide a significant social or economic benefit to the County.

### **3. Designated Specific Plan Areas**

The following Specific Plan Areas (SPAs) are shown on Figure 2 and designated on the Land Use Plan of the County General Plan. In these areas, except for the Mesquite Lake SPA, a Specific Plan, approved by the Imperial County Board of Supervisors, is required prior to any significant new use or development, except agricultural use.

#### **East Border Crossing Specific Plan Area**

The East Border Crossing Specific Plan Area is located adjacent to the International Boundary approximately 5 miles east of the City of Calexico. It encompasses approximately 1,700 acres bounded on the west by the Ash Canal, on the north by a line approximately 1,300 feet north of Highway 98, on the east by the Alamo River, and on the south by the Republic of Mexico.

The Specific Plan Area surrounds the new 87-acre port of entry (POE) on the U.S. side of the border which is to be developed by the U.S. General Services Administration (GSA). Construction of the POE should begin in 1993 and will result in the largest land crossing located along the 2,000-mile Mexico-U.S. border. Upon completion, the GSA expects that all commercial traffic currently using the Calexico crossing and much of the east-bound commercial traffic from the Tijuana area now using the Otay Mesa crossing in San Diego County, will be diverted to the new POE. Upon completion in 1995, the planned new State Route 7 connecting the POE and SR-98 is projected to carry an average of nearly 19,000 vehicles per day.

#### Objectives

The East Border Crossing Specific Plan Area is intended to be developed primarily with industrial, office, and warehouse space for manufacturers, customs brokers, freight forwarders, and corporate or administrative offices. Secondary land uses would include retail, restaurant, and service commercial outlets, a truck service center, motel accommodations, housing, and recreation.

The Specific Plan shall be coordinated with the City of Calexico and all affected local, state, and federal agencies, and major property owners on both sides of the border.

Development of public services within the SPA shall be provided concurrent with need.

Extension of rail service to the SPA will provide additional economic benefits for the project and should be pursued.

Existing agricultural uses adjoining the SPA shall be protected from incompatible land uses and the "right to farm" shall be preserved.



Water quality, natural habitat, and visual benefits of the Alamo River shall not be adversely impacted by the proposed development.

### Policies

The primary land uses of industrial, office, and warehouse space shall account for not less than 65 percent of the net developable area of the SPA. Net developable area excludes land for major roadways, other infrastructure improvements, and natural or recreational open space. The remaining 35 percent is limited to retail, restaurant, service commercial outlets, truck service center, motel accommodations, and housing.

An adequate, independent market analysis shall be required to support proposed land uses. The market analysis shall include an analysis of the need for housing, including employee housing affordable to low to moderate income households.

Development plans shall be coordinated with the U.S. General Services Administration, Border Patrol, and other appropriate federal agencies; landowners on the Mexican side of the border and appropriate agencies of the Mexicali city government and the Republic of Mexico; the City of Calexico; Imperial Irrigation District; and Caltrans and other appropriate State agencies.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms, and timing for their construction. This includes, sewer, domestic water, transportation, fire and police protection, and schools.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Agriculture, air and water quality, biology, cultural resources, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.

### **Felicity Specific Plan Area**

The Felicity Specific Plan Area encompasses approximately 8,960 acres located on both sides of Interstate 8 at the Sidewinder Road interchange, approximately 18 miles east of the East Highline Canal. Included are the south half of Sections 3-6, and all of Sections 7-10 and 15-22, all in Township 16 South, Range 21 East, S.B.B.M.

The Specific Plan Area surrounds the emerging development of Felicity which contains attractions and services for travelers on Interstate 8. Most of the SPA is privately owned land, representing the largest block of private land located on I-8 between the East Highline Canal and the Arizona Border, a distance of some 40 miles. Thus, it represents a potential "New Town" which can provide a balanced community of jobs, housing, recreation, and community and tourist services.





## Objectives

The Felicity Specific Plan Area is intended to be developed with a full range of residential, commercial, and light industrial uses in a manner which is compatible with the natural setting of the site and its visibility from I-8.

The Specific Plan shall provide areas of clustered urban level residential densities up to 7 dwelling units per acre, multi-family housing up to 29 dwelling units per acre, and low density rural homesites on lots of 1 acre and larger. The overall residential density, averaged over the entire SPA, shall be from 0.1 to 0.4 dwelling units per acre, yielding approximately 900 to 3,600 dwelling units, based on the estimated acreage of 8,960 acres.

The Specific Plan shall include a plan to phase residential and job-creating land uses so that a balanced development of jobs and housing results.

The Specific Plan shall be coordinated with the Bureau of Land Management (BLM) and affected local agencies.

Extension of public services to the SPA shall be provided concurrent with need.

## Policies

The Specific Plan shall contain a broad mix of residential, commercial, industrial, and recreational land uses and shall include a detailed market analysis to support proposed land uses. Clustering of development into nodes or neighborhoods will be encouraged.

The proposed number of residential units shall be justified by the amount of job-creating land uses proposed. The need for retirement housing and recreational uses shall also be supported by the market analysis.

The Specific Plan shall include design guidelines for the following: The physical arrangement of streets, land use areas, and open space/recreation; the project's desired architectural character; and appropriate landscape materials. Simple, traditional architectural forms which avoid the overly busy clutter of architectural elements are preferred.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms and timing for their construction. This includes, sewer, domestic water, transportation, fire and police protection, parks, and schools.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Air and water quality,



biology, cultural resources, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.

### **Glamis Specific Plan Area**

The Glamis Specific Plan Area encompasses approximately 160 acres bisected by State Highway 78 approximately 27 miles east of the City of Brawley. The Southern Pacific Railroad crosses the site on the east. Life at Glamis is centered around off-road vehicle activity at the Algodones Sand Dunes and Osborne Scenic Overlook.

#### Objectives

The Glamis Specific Plan Area is intended to accommodate recreation-supporting land uses including retail and service commercial, motel accommodations, recreational vehicle and mobilehome parks, and community facilities.

The Specific Plan shall be coordinated with the Bureau of Land Management (BLM) and affected local agencies.

Public services to the SPA shall be provided concurrent with need.

#### Policies

The Specific Plan shall focus on visitor-serving facilities and accommodations. Residential uses shall not be intended for permanent occupancy except as needed for on-site employees.

The Specific Plan shall include design guidelines for the physical arrangement of land uses and open space/recreation areas. Adequate open space shall be provided within the developed areas to complement the open space character of the area. Buildings should be sited to allow through views from Highway 78 to open space beyond.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms, and timing for their construction. This includes, sewer, water, and fire and police protection.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Air and water quality, biology, noise, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.



## Holtville Air Strip Specific Plan Area

The Holtville Air Strip encompasses approximately 1,830 acres located 6 miles east of the City of Holtville. The East Highline Canal runs along the west boundary of the site. Road access is provided by Norrish Road and Worthington Road.

Constructed as the Auxiliary Air Station by the U.S. Navy in World War II, Holtville Airport is now owned and operated by the County of Imperial, though by deed from the federal government, it may be re-established as a military airfield in the future. It has the longest and widest runway, plus the greatest land area of any of the public use airports in the County and was selected as one of the preferred sites for a "wayport", a super-regional airport hub that would primarily serve as a place where passengers would transfer between local and long-haul flights. The airstrip is presently unattended, contains no facilities, and is seldom used; but represents an opportunity to develop job-producing land uses benefitting the City of Holtville and the region.

### Objectives

The Holtville Air Strip Specific Plan Area is intended to allow development of a regional airport and support facilities; and also to accommodate light to medium industrial uses, primarily those conducted within enclosed buildings. Community facilities and agricultural packing and processing may also be appropriate. Residential uses shall not be permitted.

The Specific Plan shall be coordinated with the City of Holtville, Bureau of Land Management (BLM), and other affected local agencies.

Public services to the SPA shall be provided concurrent with need.

### Policies

The Specific Plan shall focus on job producing manufacturing and service uses. Establishment of an airport at or adjacent to the site is not a requisite for development, but should be evaluated for feasibility throughout the process. The land use plan should be designed to accommodate a potential future decision to site a regional airport.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms, and timing for their construction. This includes, sewer, water, and fire and police protection.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Agriculture, air and water quality, biology, cultural resources, growth inducement, noise, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.





## **Mesquite Lake Specific Plan Area**

Mesquite Lake is located between the Cities of Imperial and Brawley and is predominantly affected by soils that are high alkaline which reduces agriculture production. The proposed Specific Plan Area encompasses approximately nine square miles bordered on the west by State Highway 86, on the north by Carey Road, on the east by Highway 111, and on the south by Harris Road. The Holly Sugar Plant, and manure cogeneration and biomass plants, exist on the site.

### Objectives

The Mesquite Lake Specific Plan Area provides the opportunity to develop new light, medium, and heavy industrial land uses. Residential uses are not permitted because they are not compatible with planned industrial uses and surrounding agricultural uses.

The Specific Plan will be coordinated with the County of Imperial, City of Imperial, and other affected local agencies.

Public services to the SPA shall be provided concurrent with need.

### Policies

The Specific Plan shall focus on job-producing industrial uses. Agriculture-related uses such as packing and processing, waste processing, equipment manufacturing and maintenance, and production and distribution of farm chemicals would be permitted.

The area also contains geothermal resources which should be developed if economically feasible. Direct geothermal heat uses are also strongly encouraged in this area.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms, and timing for their construction. This includes, sewer, water, and fire and police protection.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Agriculture, air and water quality, biology, cultural resources, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.

## **Tamarack Canyon Ranch Specific Plan Area**

The Tamarack Canyon Ranch Specific Plan Area is approximately 1,200 acres of privately owned land. It is bounded on the west by Forrester Road, on the north by Keystone Road, and on the south by Larsen Road. The New River forms the east boundary of the SPA.



The Tamarack Canyon Ranch Specific Plan Area is one of the most scenic properties in the region. The property includes 2.5 miles of canyon which is uniquely suited to development of a destination resort hotel and recreational community.

### Objectives

The Tamarack Canyon Ranch Specific Plan Area is intended to be developed as a resort community. Primary uses would include a destination resort hotel, golf courses, lakes, attached and detached housing. The objective is to create an attractive recreation oriented community for use by local residents and vacation visitors.

The Specific Plan will be coordinated with the County of Imperial, City of Imperial, and other affected local agencies.

Existing agricultural uses adjoining the SPA shall be protected from incompatible land uses and the "right to farm" shall be preserved.

Extension of public services to the SPA shall be provided concurrent with need.

Water quality, significant natural resources, and visual benefits of the New River shall not be adversely impacted by the proposed development.

### Policies

The Specific Plan shall contain a mix of hotel, recreation uses, housing, and other resort oriented uses. The Specific Plan shall include a detailed market analysis and land use plan.

The Specific Plan shall include architectural and landscape design guidelines.

The Specific Plan shall include a public facilities financing plan outlining needed capital improvements, feasible financing mechanisms, and timing for their construction. This includes sewer, water, transportation, fire and police protection, parks, and schools.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Agriculture, air and water quality, biology, cultural resources, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.

### **CM Ranch Specific Plan Area**

The CM Ranch Specific Plan Area is a triangular-shaped area of approximately 1,790 acres located 2 miles east of the City of Calexico. Its west boundary is approximately 2,500 feet west





of Bowker Road, the north and east boundary is the Central Main Canal, and the south boundary is Anza Road adjacent to the International Boundary.

### Objectives

The CM Ranch Specific Plan Area is intended to be developed as a recreation-oriented residential community with lakes, golf course, and an equestrian center. Other uses would include a motel, neighborhood and general commercial uses, school and park sites, and the historic C&M Ranch House.

The Specific Plan shall be coordinated with the City of Calexico and other affected local agencies.

Public services to the SPA shall be provided concurrent with need.

### Policies

The Specific Plan shall contain a mix of residential, recreation, commercial, and public facility uses, and shall include a detailed market analysis and land use plan.

The Specific Plan shall include architectural and landscape design guidelines.

The Specific Plan shall include a public facilities financing plan outlining capital improvements needed for the project, feasible financing mechanisms, and timing for their construction. This includes sewer, water, transportation, fire and police protection, parks, and schools.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes an analysis of project impacts to include the following: Agriculture, air and water quality, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.

## **Heber Specific Plan Area**

The Heber Specific Plan Area includes approximately 1,660 acres between the City of Calexico on the south, the railroad to the west, Corral Road to the north, and 1,320 feet east of Highway 111. The Heber Specific Plan Area is designed to allow for mixed use development within the Heber Public Utility District due to its ability to offer urban level services.

### Objectives

The Heber Specific Plan Area is intended to allow commercial, residential, industrial and other employment oriented development in a mixed use orientation.



The Specific Plan will be coordinated with both the City of El Centro, Calexico and any other affected agencies.

Public services will be provided concurrent with need.

### Policies

The Specific Plan shall allow for a wide range of development opportunities which can conform in a mixed use setting.

The Specific Plan shall include architectural and landscape design guidelines which assure sensitivity to the regional corridor of Highway 111.

The Specific Plan shall include a public facilities financing plan outlining capital improvement needed for the project, feasible financing mechanisms, and timing for their construction. This includes sewer, water, and fire and police protection.

The Specific Plan shall be accompanied by an Environmental Impact Report which includes the analysis of project impacts to include the following: Agriculture, air and water quality, biology, cultural resources, growth inducement, traffic, visual/aesthetics, and such other issues as required by the County of Imperial and other Responsible Agencies.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

Knowledge, experience and reasoned expectations of future conditions determines the scope of the issues that the Land Use Element must address. This chapter includes a generalized description of existing physical, cultural, and land use features within the County, from both a historic and expected future perspective.

### **B. Land Use/Population**

Imperial County is, and will continue for the foreseeable future to be, a predominantly agricultural area. Presently, approximately one-fifth of the nearly 3 million acres of the County is irrigated for agricultural purposes. In addition, approximately 50 percent of County lands are largely undeveloped and under federal ownership. The developed area where the County's incorporated cities, unincorporated communities, and supporting facilities are situated comprise less than one percent of the land (see Table 1).

Imperial County Planning/Building Department bases its population estimates on building permits and housing unit change. From this annual compilation, the Population Research Unit of the California Department of Finance (DOF) estimates the annual change in population. According to these 1992 estimates, the population estimate for the unincorporated area is 28,826, with the total population estimate for Imperial County being 117,421. This compares to the 1990 census results of 27,360 for the unincorporated area and 109,303 for the entire County (see Table 2). According to DOF figures, the average household size county-wide is approximately 3.3 persons per household, with the average in cities being 3.42 persons per household and the average in the unincorporated area being 2.96 persons per household.

Population in the unincorporated areas of the County tends to concentrate in agricultural areas and in recreation/retirement communities. Agricultural related communities include the townsites of Heber, Niland and Seeley in the Imperial Valley. Along the Colorado River, in the eastern portion of the County, small population clusters exist within the townsites of Palo Verde and Winterhaven. Recreation/retirement communities include Ocotillo/Nomirage located in the southwest portion of the County, and Hot Mineral Spa and Bombay Beach, on the northeastern shore of the Salton Sea. The West Shores communities of Salton City, Salton Sea Beach, and Desert Shores are also largely retirement and recreation communities, though increasingly their populations are becoming more diversified. These communities experience a noticeable increase in population during the winter months when visitors converge to the area to avoid cold/wet winters in other parts of the country.

The seven incorporated cities: Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland, account for 75 percent of the total population (Table 2). In the past, incorporated cities have grown at a faster pace than the rural areas. Recently, residential development has increased in agricultural areas away from cities and communities. This has created conflicts with agriculture, in spite of the County's "Right to Farm" ordinance (see





Agriculture Element). Also, treated water is generally not available in these areas and the U.S. Environmental Protection Agency has, by Administrative Order of December 22, 1992, prohibited Imperial Irrigation District from providing service to these residences from untreated canal water. Attempts to resolve this situation, including installation of in-home treatment systems, are on-going.

**TABLE 1  
IMPERIAL COUNTY  
LAND USE DISTRIBUTION (IN ACRES\*)**

Irrigated (Agriculture)		
	Imperial Valley	512,163
	Bard Valley (Including Reservation)	14,737
	Palo Verde Valley	7,428
	<b>Total</b>	<b>534,328 (18.2%)</b>
Developed		
	Incorporated	9,274
	Unincorporated	8,754
	<b>Total</b>	<b>18,028 (0.6%)</b>
Salton Sea**		211,840 (7.2%)
Desert/Mountains		
	Federal	1,459,926
	State	37,760
	Indian	10,910
	Private	669,288
	<b>Total</b>	<b>2,177,884 (74.0%)</b>
<b>IMPERIAL COUNTY TOTAL</b>		<b>2,942,080 Acres</b>

\* All acreages are approximations and should, therefore, only be used for informational purposes.

\*\* Calculated at elevation of -230.

Source: Imperial County General Plan, County Overview-September 1985.



**TABLE 2**  
**IMPERIAL COUNTY POPULATION AND HOUSING (1990)**

Community	Population	Housing Units
Brawley	18,923	6,124
Calexico	18,633	4,832
Calipatria	2,690	757
El Centro	31,384	10,180
Holtville	4,820	1,477
Imperial	4,113	1,372
Westmorland	1,380	432
<b>City Subtotal</b>	<b>81,943</b>	<b>25,174</b>
Unincorporated Area	27,360	11,375
<b>Total</b>	<b>109,303</b>	<b>36,549</b>

Source: Bureau of the Census/U.S. Department of Commerce

**IMPERIAL COUNTY POPULATION AND HOUSING**  
**UNINCORPORATED COMMUNITIES**  
**1990**

Community	Population	Housing Units
Heber	2,566	600
Niland	1,183	535
Seeley	1,228	365
Ocotillo, Nomirage, Plaster City	719	648*
Salton Sea	1,953	1,263
Winterhaven/Bard	3,155	1,637*
<b>Total</b>	<b>10,804</b>	<b>5,048</b>

\* Estimated from 1980 figures, adjusted based on 1990 population.

Source: 1990 Census, Department of Finance

Increasingly, the local economy is becoming more diversified and less reliant on the economic cycles of agriculture. In addition to economic diversification, there are a number of other factors which may accelerate population growth in the future and alter the above forecasted figures. For example, the construction of two State prisons in the area; the growth of the geothermal industry in the area; the expansion of the Naval Air Facility; an additional Mexico/USA border crossing; and approval of the North American Free Trade Agreement (NAFTA) between the U.S., Mexico, and Canada. For further detailed County demographics, refer to the Housing Element.





## C. Water/Power Resources

### Water

Since its inception, the history of Imperial County has been tied to the availability of water for agriculture. Agriculture is the County's main economic activity for the foreseeable future. The availability of water will play an important role in determining the population and economic growth of Imperial County.

The need to conserve water and improve irrigation methods will undoubtedly become more important in the future. The County shall continue to support measures to conserve water and its beneficial uses, however it is necessary to ensure that the future growth and development of the area is not jeopardized by the redistribution of locally used water resources to other regions of the state. The loss or redistribution of this resource will have a detrimental effect on the area's economy. Safeguards must be included in any proposed water transfer to assure that significant environmental impacts do not occur and continued local water availability is assured.

See the Water Element and Conservation and Open Space Element for further information on water issues.

### Power

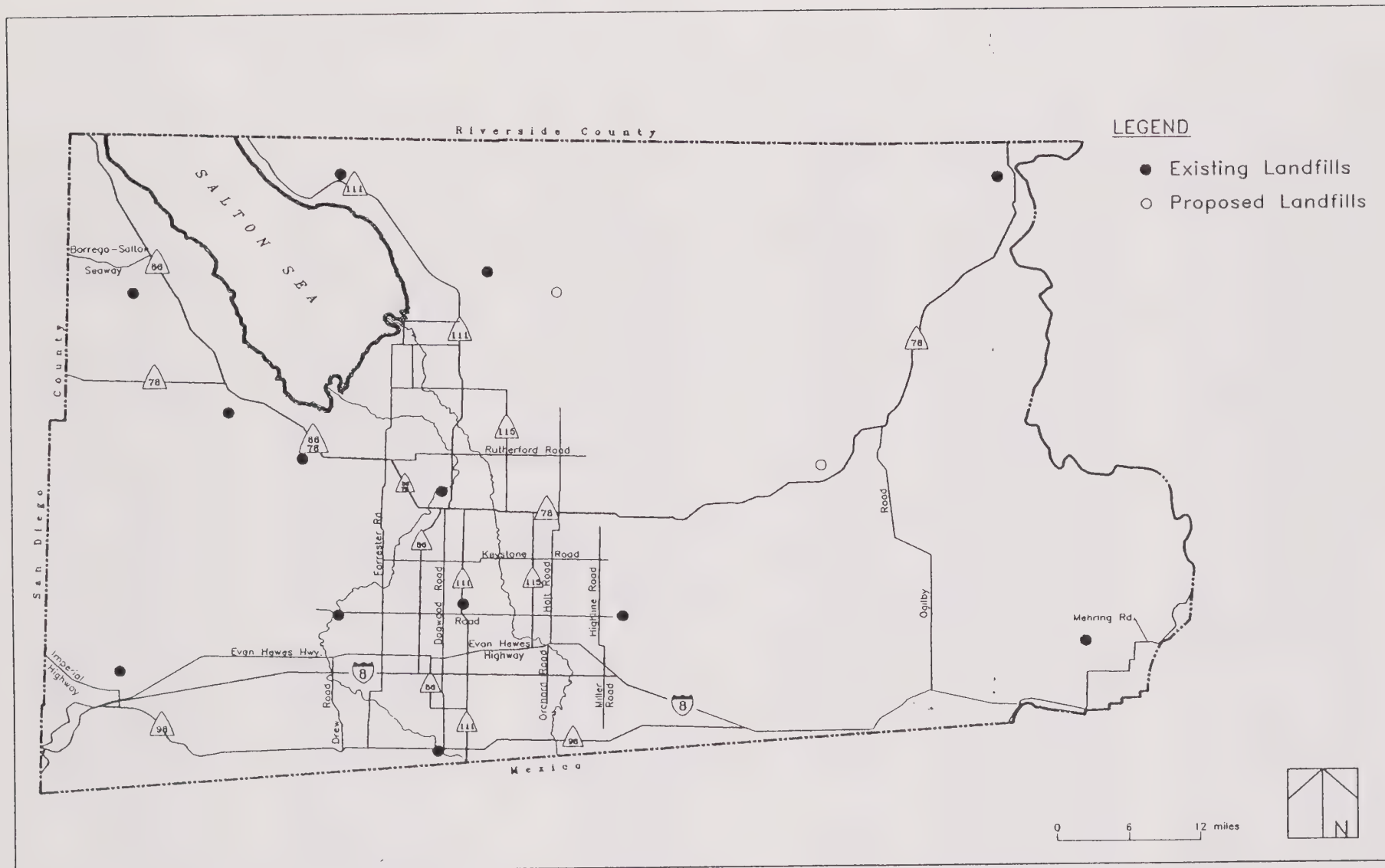
Electrical power is supplied to most parts of the County by the Imperial Irrigation District (IID), except for the northeastern section which is served by Southern California Edison. In 1992, IID was serving approximately 75,000 electricity customers in Imperial Valley, and also to parts of Riverside and San Diego County. Continual upgrading of the District's electrical supply and distribution system has enabled them to continue to provide efficient service for residential, commercial, and industrial growth for the County from conventional fuel sources, as well as from hydroelectric, steam, geothermal, and nuclear sources. New agreements with the Los Angeles Department of Water and Power and Southern California Edison, provide firm transmission service, allowing the District to increase its power purchase opportunities from many southwest sources. (IID, 1991 Report.)

## D. Solid Waste Disposal Facilities

Research to identify and reserve sites for use as landfills is currently handled by the County Department of Public Works and the County Integrated Waste Management Plan. Once a suitable site has been identified, reserving the potential future landfill site may help to prevent encroachments by incompatible surrounding land uses. The use of buffer zones around existing landfills and the preservation of areas suitable for expansion for these sites may avoid the more difficult and time consuming task of developing a new landfill location. As a consequence, protecting existing sites from incompatible encroachments is very important.

Currently there are ten County-operated Class III disposal sites throughout Imperial County which accept non-hazardous wastes (Figure 3). The current disposal capacity of existing landfills is considered to be sufficient to meet the needs of the County to at least year 2005 (Armas, 1992).





Imperial County  
General Plan

Existing/Proposed Solid Waste Disposal Facilities

Land Use Element

Figure  
3



Four of the County landfills, near Brawley, Hot Mineral Spa, Imperial, and Calexico, are under the ownership or control of the County; five, Holtville, Niland, Salton City, Ocotillo, and Palo Verde, are on Bureau of Land Management (BLM) property; and one, the Picacho landfill, serves the Winterhaven/Bard area and is located on land owned by the Quechan Indian Reservation. Since the Quechan Indians have the right to terminate the County's use of the site on short notice, a nearby alternate site, on Bureau of Land Management land, has been reserved on a contingency basis. Most likely, the County would have to acquire ownership of this alternate site from BLM in order for it to be used as a landfill.

In addition to the public sites, Imperial Republic Acquisitions operates a private Class III waste disposal facility in the unincorporated area northwest of the City of Imperial; Laidlaw Environmental Services operates a Class I facility west of the City of Westmorland; and Desert Valley Company operates a Class II solid waste disposal/storage site northwest of the City of Westmorland. Two Class III private landfills are also proposed, but have not been approved at this time, which would dispose of municipal waste imported by rail from the Los Angeles-Orange County region. These proposed landfill sites are located southwest of the Chocolate Mountains and east of Glamis.

For more detailed information on hazardous waste disposal sites, please refer to the Health Department, Imperial County Hazardous Waste Management Plan. The Imperial County Integrated Waste Management Plan is being prepared by the Department of Public Works, with a draft to be presented to the State Integrated Waste Management Board in January 1994.

#### **E. Schools**

Within the County, the educational system is made up of seventeen school districts consisting of 37 elementary schools, seven high schools, six adult schools, one community college (Imperial Valley College) and one university (San Diego State University-Imperial Valley Campus) (see Figure 4). The Imperial County Office of Education serves as the intermediate unit between the school districts and the State Department of Education. Among the services provided are Special Education, Migrant Education, Youth Employment Services and the Regional Occupation Program.

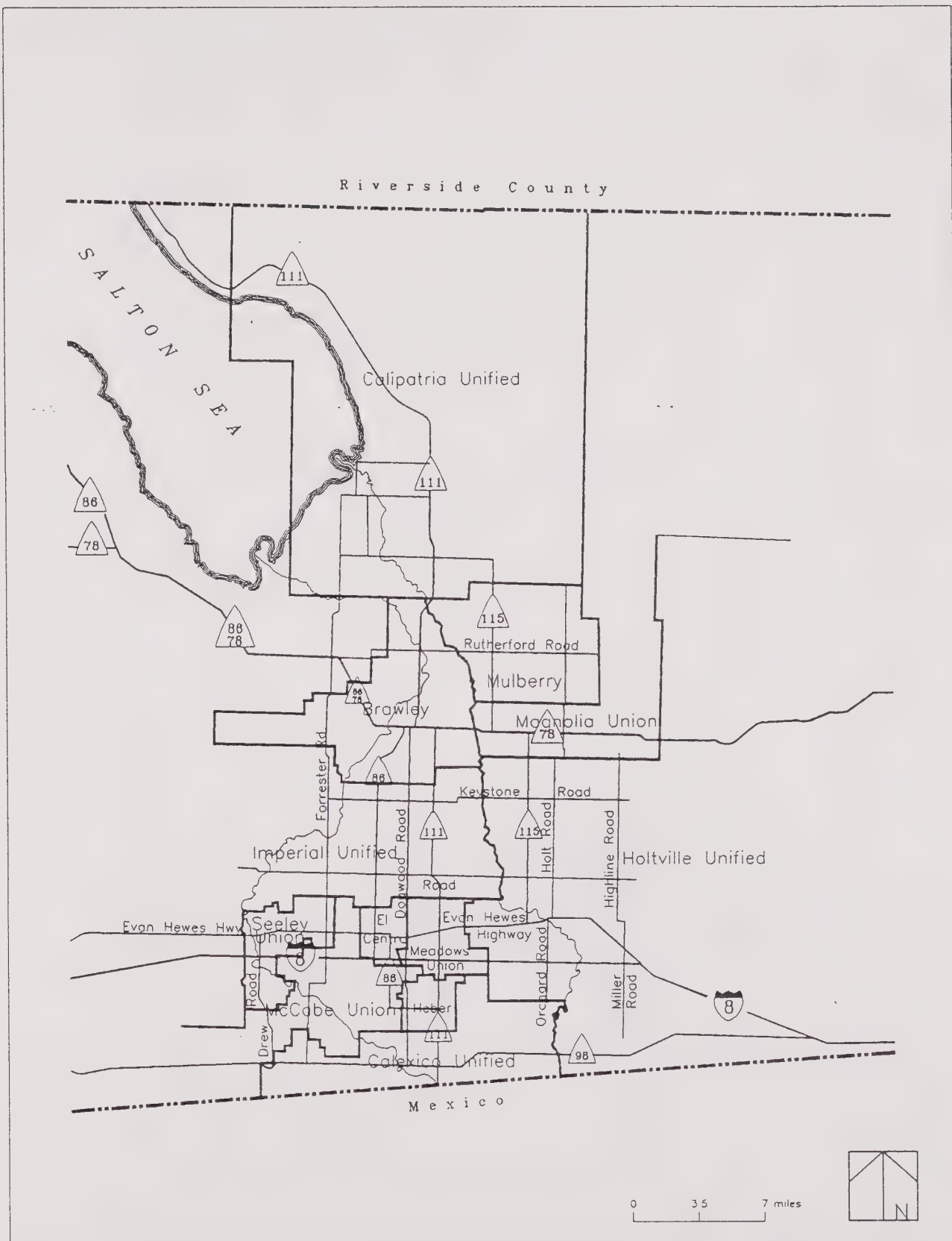
#### **F. County Buildings and Grounds**

County facilities include administrative, court, field operations, detention facilities, and park and recreation sites as shown on Figure 5. The County Administration Center and Superior Courthouse are both located within the County Center I in the City of El Centro, which is the County Seat. The Sheriff's Department, Probation Department, Department of Education, County adult and juvenile detention facilities are all located within the County Center II complex located just south of El Centro. A facility for abused, abandoned, or neglected children is also due to open at County Center II by 1993.

The Sheriff's Department maintains substations in the City of Brawley, Salton City, and Winterhaven and resident deputies in Ocotillo, Bombay Beach, Niland, and Palo Verde. The main facilities of the Imperial County Fire Department/Office of Emergency Services (OES) are within the grounds of the Imperial County Airport (County Center III) in the City of Imperial. Road yards are maintained by the Department of Public Works in Heber, Brawley, Imperial, and Holtville. "Satellite" maintenance stations are operated at Salton City, Palo Verde, and Bard.





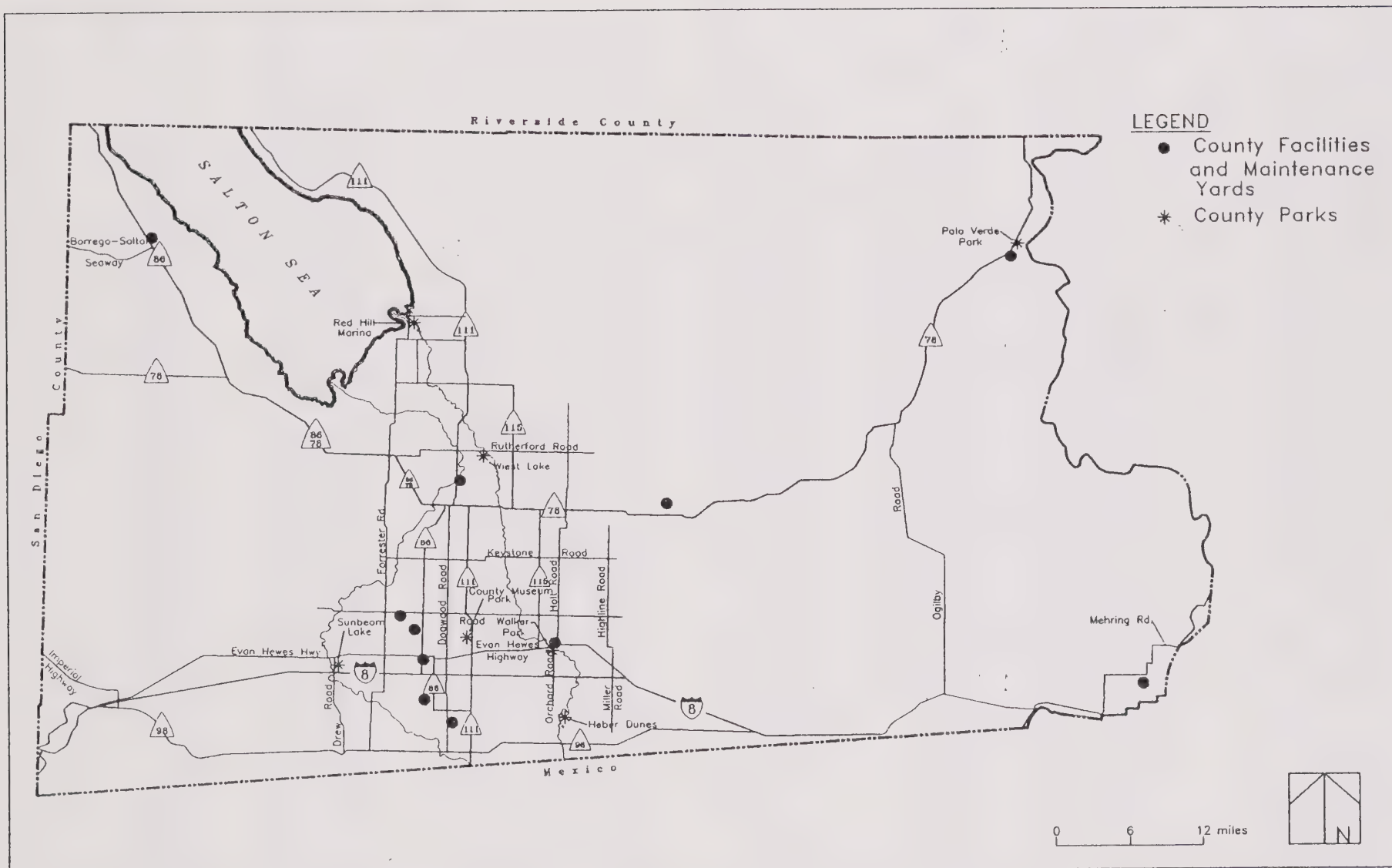


Imperial County  
General Plan

School Facilities  
Land Use Element

Figure  
4





Imperial County  
General Plan

County Facilities

Land Use Element

Figure  
5





Recreational facilities operated by the Department of Parks and Recreation/Buildings and Grounds are located at Sunbeam Lake, Wiest Lake, Red Hill Marina, Palo Verde County Park, Heber Dunes, and Walker Park. A County park adjoining the new Pioneer Museum has also recently been completed just south of the Imperial Valley College campus. The Imperial Valley College Museum is also planning to build a desert information center/museum adjacent to the townsite of Ocotillo.

#### **G. Federal and State Facilities**

With approximately 1,460,000 acres, the federal government owns approximately one-half of all land in the County, primarily the Department of the Interior's Bureau of Land Management (BLM) property and U.S. Military lands. BLM allows open recreational uses in several areas, including three sites in the Imperial (Algodones) Sand Dunes: Gloomiest/Gawky, Buttercup Valley, and Mammoth Wash. Hiking and ORV trails also exist on BLM lands throughout the County.

Military activities are centered at the Naval Air Facility El Centro, located north of Seeley, with military field and aerial operations conducted on approximately 350,000 acres in the Chocolate Mountains, 76,800 acres in the Superstition Mountains, 36,600 acres at the Salton Sea Test Base, and at other smaller sites throughout the County. The military's Yuma Proving Grounds, centered in Arizona, also includes lands in the southeast portion of the County.

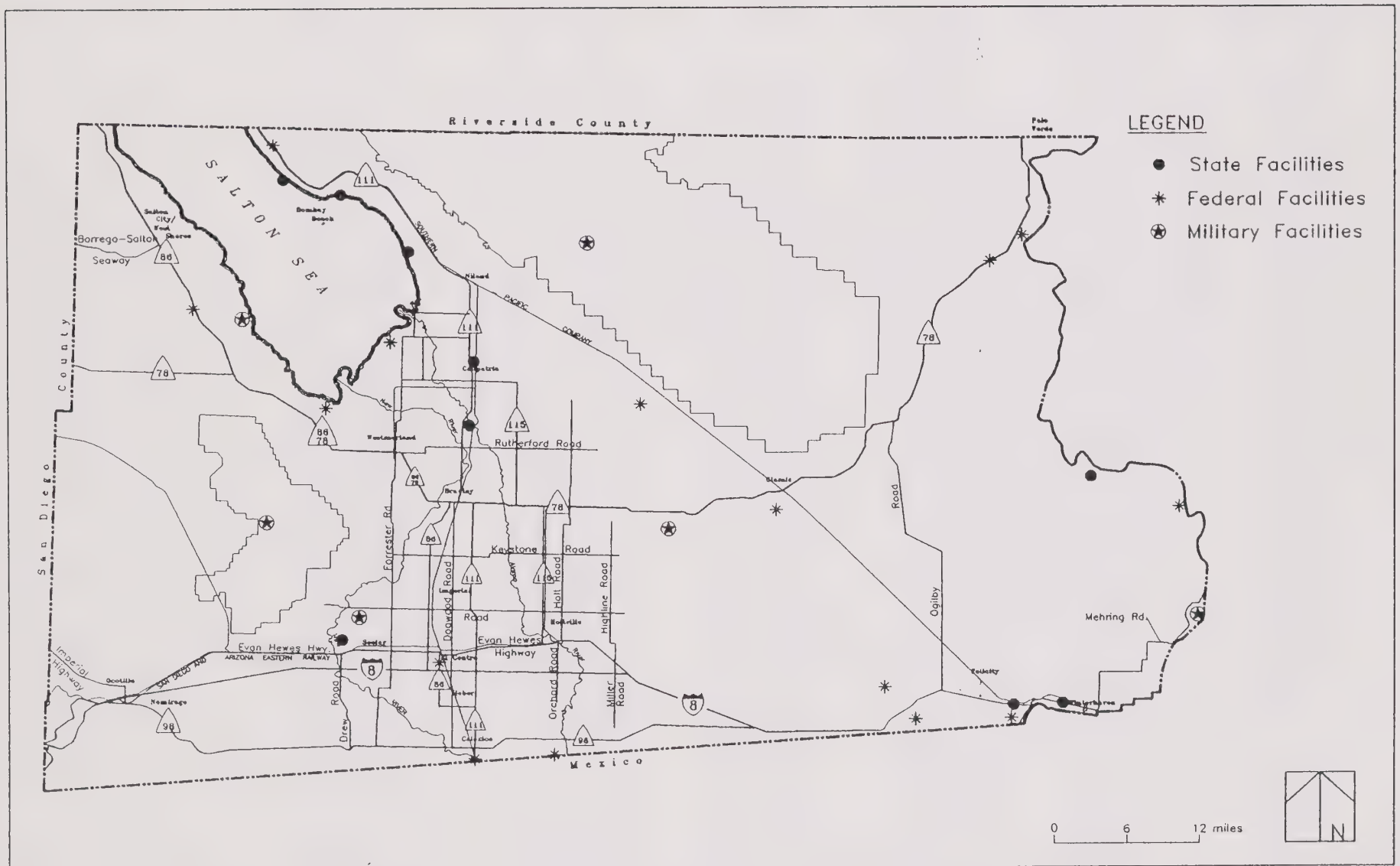
Other federal sites include National Wildlife Refuges at the south end of the Salton Sea and two sites on the Colorado River -- Cibola near Palo Verde, and Imperial farther south. U.S. Border Patrol are located at the Mexicali/Calexico and Algodones/Andrade Ports of Entry, with Border Patrol inspection station also operated on Highway 86/78 south of Salton City, Highway 111 north of Bombay Beach, and Highway 78 south of Palo Verde.

The General Services Administration has announced plans to construct a new international Port of Entry east of the City of Calexico. The purpose of the port is to alleviate heavy traffic conditions at the Calexico Port of Entry caused in part by population growth and the growing importance of the region's economic and social ties with Mexico and the Mexicali area (estimated population 1,000,000). The new port of entry will provide increased accessibility to commercial and private vehicles to and from the U.S. and Mexico. Construction of the proposed border crossing is expected to commence sometime in 1993 and be complete in 1995. Upon completion in 1995, the planned new State Route 7 connecting the POE and SR-98 is projected to carry an average of nearly 19,000 vehicles per day.

State facilities consist of park lands of Anza-Borrego State Park and Ocotillo Wells State Recreation Area; the Salton Sea State Recreation Area on the east shore; and Picacho State Recreation Area on the Colorado River. The State Department of Fish and Game also manages two units of the Imperial Wildlife Area -- the Wister Unit on the east shore near Niland, and the Finney-Ramer Unit on the Alamo River near Calipatria.

The State Department of Corrections recently constructed a maximum-security prison in the area northeast of the City of Calipatria and a medium-security prison near Seeley. An agricultural pest inspection station is located on I-8 west of Winterhaven, and a Highway Patrol field office is planned at Felicity.





Imperial County  
General Plan

Federal and State Facilities

Land Use Element

Figure  
6



Neither the County nor local cities have land use authority on federal and state lands; nor do they have authority on Indian Reservation lands which are the Torres-Martinez Reservation adjacent to the Riverside County line in the Salton City area, and the Quechan Reservation in the Winterhaven-Bard area.

## **H. Natural/Mineral Resources**

Most of the natural and mineral resources of Imperial County are still being developed. Opportunities and needs for mineral materials are found in the County's expanding economy. The more obvious needs are related to the demands of the construction industry. The need to develop additional sources of sand and gravel is expected to increase in the future.

Gypsum is being mined in the Fish Creek Mountains near the San Diego County line and transported by private rail line to a drywall plant at Plaster City. Pumice and claystone for expanded lightweight aggregate are ready for production when the need arises. Industrial materials such as kyanite, mineral fillers (clay, limestone, sericite mica, tuff), salt, potash and calcium chloride (geothermal sources), and sand are readily available.

The County also has large reserves of geothermal fluids. Geothermal energy is the natural heat of the earth that is brought to the surface by wells. These very hot fluids are then used to produce heat and/or electricity. The earliest attempt to develop geothermal steam for power in Imperial County was in 1927. Since then, the geothermal industry has become an important part of the County's industrial base. It has been estimated that Imperial County may have more geothermal energy than any other area in the United States.

Some of the geothermal brines are also rich in potash among other minerals, which offer additional incentives for mineral and geothermal development. The potential products of these fluids for electric power, fresh water, and minerals may provide the Imperial Valley with new industries. Low cost power sources could provide an added incentive for new industrial development, thus enhancing the value of the County's minerals. Please refer to the Geothermal and Transmission Element for further information on geothermal resources.

Gold and manganese deposits in the County contain sizable reserves, although only recently have economics and more efficient mining and processing methods allowed the increased development of the resources. Gold Fields Mining Company, American Girl Joint Venture and Chemgold (Picacho Mine), all located in the eastern portion of the County, are the major producers of gold ore in the County. For more information on natural and mineral resources, please refer to the Conservation and Open Space Element.





### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Land Use Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing development policies and land uses in Imperial County. This section (Chapter III) of the Land Use Element presents Imperial County's Goals and Objectives relative to all land use within the unincorporated areas of the County. They have been prepared in collaboration with the General Plan Ad-Hoc Advisory Committee appointed by the Board of Supervisors.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for land use decision making. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Commercial Agriculture**

Goal 1: Preserve commercial agriculture as a prime economic force.

Objective 1.1 Encourage the continued agricultural use of prime/productive agricultural lands.

Objective 1.2 Discourage the location of incompatible development adjacent to productive agricultural lands.

Objective 1.3 Identify compatible agriculture-related uses appropriate for location in agricultural areas.

##### **Economic Growth**

Goal 2: Diversify employment and economic opportunities in the County while preserving agricultural activity.

Objective 2.1 Achieve a balanced and diversified local economy with a variety of economic and employment opportunities.

Objective 2.2 Provide adequate space and land use classifications to meet current and projected economic needs for commercial development.



Objective 2.3 Continue to evaluate economic development strategies, including new industrial, commercial, and tourist-oriented land uses. Tourist-oriented uses must be compatible with BLM management goals in areas near BLM lands.

## **Regional Vision**

Goal 3: Achieve balanced economic and residential growth while preserving the unique natural, scenic, and agricultural resources of Imperial County.

Objective 3.1 Maintain and improve the quality of life, the protection of property and the public health, safety, and welfare in Imperial County.

Objective 3.2 Preserve agriculture and natural resources while promoting diverse economic growth through sound land use planning.

Objective 3.3 Attain County growth and development patterns that are orderly, safe, and efficient utilizing appropriate financing resources.

Objective 3.4 Protect/improve the aesthetics of Imperial County and its communities.

Objective 3.5 Ensure safe and coordinated traffic patterns, contiguous growth, and promote a planned and consistent development around city/township areas.

Objective 3.6 Recognize and coordinate planning activities as applicable with the Bureau of Land Management (BLM), and the California Desert Conservation Plan.

Objective 3.7 Establish a continuing comprehensive long-range planning process for the physical, social, and economic development of the County.

Objective 3.8 Utilize non-agricultural land as a resource to diversify employment opportunities and facilitate regional economic growth. Uses must be consistent with each site's resource constraints, the natural environment, and the County Conservation and Open Space Element

Objective 3.9 Promote water recreation activities in Imperial County in suitable areas along the New, Alamo, and Colorado Rivers, and in the Salton Sea.

Objective 3.10 Identify and pursue funding sources for clean up of the New and Alamo Rivers and the Salton Sea.

Objective 3.11 All zoning within the County of Imperial will be compatible with the General Plan.

## **Towns and Communities**

Goal 4: Preserve and enhance distinctive historic desert towns and newer communities.

Objective 4.1 Preserve and enhance existing urban and rural communities.





Objective 4.2 Encourage distinctive community identities.

Objective 4.3 Maintain and require compatible land uses within the existing communities.

Objective 4.4 Limit the establishment of non-residential uses in predominantly residential neighborhoods and require effective buffers when appropriate non-residential uses are proposed.

Objective 4.5 Specific Plan Area designation should be used for outlying proposed growth areas in order to better determine appropriate land uses and the timing and financing for needed community facilities.

### **Housing Opportunities**

Goal 5: Encourage the compatible development of a variety of housing types and densities to accommodate regional population projections and special housing needs.

Objective 5.1 Provide sufficient, suitable residential sites and housing supply to meet projected housing needs of all segments of the population.

Objective 5.2 Promote affordable housing for residents of all income groups, including low and moderate income households.

### **Industrial Development**

Goal 6: Promote orderly industrial development with suitable and adequately distributed industrial land.

Objective 6.1 Provide adequate space and land use classifications to meet current and projected economic needs for industrial development.

Objective 6.2 Ensure that development in the areas surrounding military, public, and private airports are consistent with the Airport Land Use Compatibility Plans.

Objective 6.3 Protect industrial zoned areas from incompatible adjacent land uses and from under-utilization by non-industrial uses.

### **Extractive Resources**

Goal 7: Identify and protect areas of regionally-significant mineral resources which are in locations suitable for extractive uses.

Objective 7.1 Provide adequate space and land use classifications to meet current and projected economic needs for extractive activities.

Objective 7.2 Require that extractive uses are designed and operated to avoid air and water quality degradation, including groundwater depletion, other adverse environmental impacts,



and comply with the State Surface Mining and Reclamation Act and County Surface Mining Ordinance.

## **Public Facilities**

Goal 8: Coordinate local land use planning activities among all local jurisdictions and state and federal agencies.

Objective 8.1 Coordinate with federal, state, and municipal agencies when planning for the acquisition and improvement of public parks and assure compatibility with adjacent communities and private property.

Objective 8.2 New developments shall provide improvements to meet the added demands for parks and recreational facilities.

Objective 8.3 Ensure that school facilities are adequate to meet the existing and projected needs of the population.

Objective 8.4 Ensure that all future proposed private and public facilities are adequate to meet expected population growth and the needed additional services around local cities.

Objective 8.5 At a minimum, provide adequate sites for solid/liquid and hazardous waste facilities to meet the current and projected demands of the County population and consistent with the County Solid Waste and Hazardous Waste Management Plans.

Objective 8.6 Ensure that land uses adjacent to or near existing waste disposal or storage facilities are compatible with those facilities.

Objective 8.7 Ensure the development, improvement, timing, and location of community sewer, water, and drainage facilities will meet the needs of existing communities and new developing areas.

Objective 8.8 Ensure that the siting of future facilities for the transmission of electricity, gas, and telecommunications is compatible with the environment and County regulation.

Objective 8.9 Require necessary public utility rights-of-way when appropriate.

Objective 8.10 Provide for the review of public transportation needs in order to accommodate countywide growth.

## **Protection of Environmental Resources**

Goal 9: Identify and preserve significant natural, cultural, and community character resources and the County's air and water quality.

Objective 9.1 Preserve as open space those lands containing watersheds, aquifer recharge areas, floodplains, important natural resources, sensitive vegetation, wildlife habitats, historic



and prehistoric sites, or lands which are subject to seismic hazards and establish compatible minimum lot sizes.

Objective 9.2 Reduce risk and damage from flood hazards by appropriate regulations.

Objective 9.3 Adopt noise standards which protect sensitive noise receptors from adverse impacts.

Objective 9.4 Coordinate with the Republic of Mexico to clean up the polluted New River and Alamo River in order to ensure public health and safety as well as recreational resources.

Objective 9.5 Establish policies and programs for maintaining salinity levels in the Salton Sea which enable it to remain a viable fish and wildlife habitat.

Objective 9.6 Incorporate the strategies of the Imperial County Air Quality Attainment Plan (AQAP) in land use planning decisions. The policies stated in the 1991 AQAP include L-1, Planning Compact Communities; L-2, Providing for Mixed Land Use; L-3, Balancing Jobs and Housing; and L-4, Circulation Management.

Objective 9.7 Implement a review procedure for land use planning and discretionary project review which includes the Imperial County Air Pollution Control District.

### C. Relationship to Other General Plan Elements

The Land Use Policy Matrix (Table 3) identifies the relationship between the Land Use Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

**TABLE 3**  
**LAND USE ELEMENT POLICY MATRIX**

Issue Area	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Open Space Conservation	Geothermal	Water
Agricultural Preservation					X	X	X	X
Economic Growth					X		X	
Land Use Planning	X	X	X	X	X	X	X	X
Housing Opportunities	X	X						
Extractive Resources						X		
Public Facilities	X			X				
Environmental Sensitivity	X	X	X	X	X	X	X	X





## IV. IMPLEMENTATION PROGRAMS AND POLICIES

### A. Preface

Both Attorney General opinions and court decisions have stressed the importance of the Land Use Element to regulate the use and intensity (both population and building) of land use areas. In that regard, each land use category identified herein has development standards that include population density and building intensity. Specific regulatory standards to implement the General Plan land use categories are contained within the County Zoning Ordinance.

Population density is defined as "the relationship between the number of dwelling units per acre and the number of residents per dwelling." Building intensity may be based upon a combination of variables such as maximum dwelling units per acre, permitted uses, height and size limitations. While some court decisions have defined population density as the number of people in an area, quantifiable standards must be stated for each land use category.

A key component of this Element is the Land Use Plan which delineates boundaries and establishes development standards for land use categories in order to maintain consistency and compatibility between uses and to classify the various land uses recognized by the General Plan. Land use categories are based on the existing land uses and the level of public facilities and services available to support new land uses.

### B. Land Use Descriptions

The permitted uses and standards which follow in Section C describe types of agricultural or industrial uses with terms such as "light", "medium", or "heavy" and commercial uses as "neighborhood" or "general". For clarity, the meaning of these terms as used herein are described below. Also, residential is described as "dwelling units per acre" which shall mean per gross acre as described below.

#### Agricultural Uses

Light Agriculture - Agricultural crop production such as field, forage, tree groves, vines, and other plant crops intended to provide food or fiber, as well as flowers and field or container plants including ornamental, landscape, agricultural, and native plants. Animal keeping, including aquaculture (fish farms), would not be a primary use, but may be allowed as a secondary or incidental use to be regulated by implementing zoning as to types of animals, numbers of animals per acre, minimum lot size for animal keeping, or setbacks from property lines for animal enclosures.

Medium Agriculture - Includes all agricultural crop production described above and permits animal keeping, including aquaculture, as a primary use. Implementing zoning may regulate types of animals, numbers of animals per acre, minimum lot size for animal keeping, or setbacks from property lines for animal enclosures. Incidental uses such as produce stands or on-site packing and processing of agricultural crops, may be permitted with limitations by implementing zoning.



Heavy Agriculture - Includes all agricultural crop production and animal keeping, including aquaculture, dairies, feed lots, and animal sales yards as a primary use. Implementing zoning may regulate numbers of animals per acre, minimum lot size for animal keeping, or setbacks from property lines for animal enclosures. Incidental uses such as produce stands may be permitted with limitations by implementing zoning. On-site packing and processing of agricultural crops and livestock, and farm labor camps, may be permitted with limitations by implementing zoning.

## Industrial Uses

Light Industry - Refers to industrial plants, and storage, distribution, and administrative facilities, for uses engaged in manufacturing, compounding, processing, assembling, packaging, treatment, or fabrication of materials and products within an enclosed building. Implementing zoning may restrict use of certain products, processes, or manufacturing equipment due to external effects such as noise, odors, smoke, or dust. Uses which involve compounding of radioactive materials, manufacturing of certain hazardous gases or chemicals, petroleum refining or large petroleum storage facilities, or manufacturing of explosives would not be permitted.

Medium Industry - Refers to industrial plants, and storage, distribution, and administrative facilities, as described above, including uses conducted outside of an enclosed building. Implementing zoning may restrict use of certain products, processes, or manufacturing equipment due to external effects such as noise, odors, smoke, or dust. Uses which involve compounding of radioactive materials, manufacturing of certain hazardous gases or chemicals, petroleum refining or large petroleum storage facilities, or manufacturing of explosives would not be permitted.

Heavy Industry - Refers to industrial plants, and storage, distribution, and administrative facilities, as described above, including uses conducted outside of an enclosed building. Implementing zoning may restrict use of certain products, processes, or manufacturing equipment due to external effects such as noise, odors, smoke, or dust; and may allow, with restrictions, uses which involve manufacturing of certain hazardous gases or chemicals, petroleum refining or storage, or manufacturing of explosives. Electrical and other energy generating facilities are heavy industrial uses, except geothermal, hydroelectric, wind and solar facilities may be regulated differently than other types of power plants by implementing zoning. Other uses such as mining and processing of sand, gravel, rock, and other metallic or non-metallic minerals, landfills, and oil or gas drilling rigs, also exhibit characteristics similar to other heavy industrial uses but may be regulated differently by implementing zoning due to necessary location.

## Commercial Uses

Neighborhood Commercial - Refers to commercial uses which provide for the sale of convenience goods, such as food, drugs and sundries, and personal services which meet daily needs of a local neighborhood trade area. A supermarket or convenience grocery store is usually a principal tenant. Offices, gasoline stations, eating and drinking establishments, and recycling collection facilities (not involving hazardous materials) are also permitted but may





be limited or restricted by implementing zoning. Automobile painting and repair would not be permitted.

General Commercial - Refers to commercial uses as described above, as well as larger retail outlets including regional centers, home improvement stores, business and construction support services, personal and business storage facilities, commercial recreation, health clubs and spas, medical, financial, and other professional offices and facilities, hotels and motels, automobile and equipment sales and services. Some of these uses may be restricted by location in certain zones, or by other limitations of implementing zoning. Agricultural and animal services may also be permitted subject to limitations of implementing zoning.

## **Residential Uses**

Dwelling Unit - Refers to a single unit providing complete, independent living facilities, including permanent provisions for living, sleeping, eating, cooking, and sanitation, and having only one kitchen. A dwelling unit includes a single family detached home (including manufactured homes), or each of the attached units in a duplex, apartment building, or residential condominium. Hotel and motel units are not dwelling units or residential uses. Lodging or boarding houses, and group living quarters are residential uses which are regulated by zoning, but are not included as "dwelling units per acre".

Dwelling units per acre - Is a statement of residential density which, for the County of Imperial, would result in an approximate average population of 3.0 to 3.5 persons per dwelling unit allowed per acre. For purposes of the County General Plan it shall mean dwelling units per gross acre and shall be determined for each separate and individually owned lot or parcel based on the gross area within the exterior boundary lines of a property. Existing public rights-of-way, railroad rights-of-way, and canals or drains shall be excluded from the gross area when calculating permitted dwelling units.

Density Bonus Per State Law - The California Government Code, Section 65915 et seq., requires each city and county to provide incentives, which may include a 25 percent density bonus, for development of lower income housing units in residential projects of five or more dwelling units. This provision, as presently stated in the Government Code or as it may hereafter be amended, is applicable to the Imperial County General Plan. For more information, please refer to the Housing Element of the General Plan.

## **C. Land Use Designations and Standards**

In order to define a clear distribution of development and preservation, the following categories have been defined: Agriculture, Community Area, Government/Special Public, Industry, Recreation/Open Space, Rural Residential, Special Purpose Facility, Specific Plan Area, and Urban Area.

The following designations and standards rely on the land use descriptions specified above. Where uses are indicated as permitted in a land use category, limitations on such uses may be required by implementing zoning, such as limiting the location or intensity of such a use, or by requiring a conditional use permit and a site-specific environmental assessment, or other form of discretionary review.



## **1. Agriculture**

This category is intended to preserve lands for agricultural production and related industries including aquaculture (fish farms), ranging from light to heavy agriculture. Packing and processing of agricultural products may also be allowed in certain areas, and other uses necessary or supportive of agriculture. The Agriculture category includes most of the central irrigated area known as the Imperial Valley, the Bard/Winterhaven Valley and the south end of the Palo Verde Valley.

Where this designation is applied, agriculture shall be promoted as the principal and dominant use to which all other uses shall be subordinate. Where questions of land use compatibility arise, the burden of proof shall be on the non-agricultural use to clearly demonstrate that an existing or proposed use does not conflict with agricultural operations and will not result in the premature elimination of such agricultural operations. No use should be permitted that would have a significant adverse effect on agricultural production, including food and fiber production, horticulture, floriculture, or animal husbandry. All non-agricultural uses in any land use category shall be analyzed during the subdivision, zoning, and environmental impact review process for their potential impact on the movement of agricultural equipment and products on roads located in the Agriculture category.

For a period of two years after adoption of this General Plan revision by the County Board of Supervisors, no land shall be removed from the Agriculture category except for annexation to a city, where needed for use by a public agency, for geothermal purposes, where a mapping error may have occurred, or where a clear long term economic benefit to the County can be demonstrated through the planning and environmental review process.

### **Residential Development Standards:**

Very low density residential land uses with not more than 1 single family dwelling unit per 40 acres or per legal parcel.

Land shall not be subdivided for residential development.

Agricultural employee housing may be permitted with a Conditional Use Permit and environmental review to determine that continued agricultural use will not be adversely impacted.

Building height maximum of 35 feet.

### **Commercial Development Standards:**

Limited neighborhood commercial land uses providing basic household goods and services; and sales of agricultural goods such as feed, grain, fertilizers, pesticides.

Maximum floor area ratio not greater than 1:1 (i.e., 1 square foot of gross building area per 1 square foot of area within the lot or building site).





Maximum building height of 35 feet.

No lot or building site shall have more than 50 percent of its net area covered with buildings or structures.

A minimum of 25 percent of the front lot area shall be landscaped.

#### **Industrial Development Standards:**

Industrial uses are not permitted except those directly associated with agricultural products and processes. This would include cotton gins, dehydration mills, seed mills, fruit, vegetable, meat and fish packing plants, hay storage and shipping, and nut shelling and cooking. Implementing zoning may require a Conditional Use Permit for some or all of these industrial uses.

Geothermal plants may be permitted with a conditional use permit subject to zoning and environmental review.

Maximum floor area ratio not greater than 1:1 (i.e., 1 square foot of gross building area per 1 square foot of area within the lot or building site).

Building height maximum of 50 feet. A lesser height may be required by the Airport Land Use Compatibility Plan.

Industrial land uses should locate in areas where high noise levels will not impact existing or planned noise sensitive land uses.

Industrial uses within this category must locate in areas having access to major transportation systems or must make provision for adequate transportation systems. Distribution facilities, such as truck transport terminals, are not allowed in this category.

#### **Open Space/Recreation Standards:**

Open space and recreation land uses within this category consists of environmentally sensitive areas, parks, fault zones, floodways and floodplains, agricultural lands, and areas designated for the managed production of mineral resources.

Commercial recreation enterprises including hunting clubs, fishing lakes, equestrian centers, dude ranches, and similar uses, however, a conditional use permit may be required by implementing zoning regulations for some types of commercial recreation enterprises.

Mobilehome parks and recreational vehicle parks and campgrounds are strictly prohibited.

#### **Solid and Liquid Waste Disposal Facilities:**

Landfills are not allowed within this category.





## 2. Community Area

The Community Area category represents land uses associated with the unincorporated communities of Hot Mineral Spa/Bombay Beach, Ocotillo/Nomirage, and Palo Verde. Their land use orientation is primarily toward relatively low density second home and retirement dwellings and recreational services, rather than urban residential, commercial, and industrial uses. Community Areas usually include small local- and tourist-serving central business districts with a rural orientation.

Urban services, including sewer, water, and physical improvements such as curbs and sidewalks are limited. Ocotillo/Nomirage is provided water service by private water companies and individual water wells; Palo Verde by the Palo Verde County Water District; and Hot Mineral Spa/Bombay Beach by the Coachella Valley Water District. Only Bombay Beach has a public sewage system, also operated by the Coachella Valley Water District, the others rely on subsurface septic systems or facilities operated by mobilehome and RV parks. Except in the Hot Mineral Spa area, future growth is expected to consist primarily of infill on existing lots, rather than expansion of community boundaries, except at very low densities. The designation of "Community Area" is not intended to preclude incorporation of a particular community.

All development within Community Areas shall also be reviewed by affected local agencies and County departments to determine that an adequate level of public services exist to serve the proposed project. This would include the off-site circulation system (County Department of Public Works), adequate water supply and pressure for fire suppression (County or City Fire Marshal), police services (County Sheriff or City Police Department), schools (local school district and County Department of Education), potable water (local water district), sewage disposal (local sanitation district or County Health Department), local park facilities (County Parks and Recreation Department), and other services which the Planning/Building Department may identify as impacted.

### Residential Development Standards:

Residential land uses at a population density from less than 1 dwelling unit per acre to a maximum of 4 dwelling units per acre. Higher densities may be allowed pursuant to an approved Master Plan for the overall Community Area where adequate public infrastructure exists.

Residential building intensity is determined by available public facilities and services and physical or environmental factors which may affect the site, including soil characteristics, groundwater conditions, etc.

New residential development must be consistent with the existing character of the community.

A minimum lot size of 20,000 square feet (net area exclusive of road and other easements) is required for new residential units where sewer service is not presently available. A larger lot size may be required for an on-site sewage disposal system to be approved by the County Environmental Health Services Division.

An on-site potable water supply approved by the County Health Department is required for all residential development.



### **Commercial Development Standards:**

Low to medium intensity commercial land uses, which can be shown to be compatible with adjacent existing or planned residential uses, including neighborhood and general commercial uses. Only neighborhood commercial uses will be permitted in the Ocotillo/Nomirage Community Area.

Maximum floor area ratio not greater than 2:1 (i.e., 2 square feet of gross building area per 1 square foot of area within the lot or building site).

Building height maximum of 35 feet.

A minimum of 10 percent of the lot area shall be landscaped. A greater percentage of landscaping may be required for projects involving discretionary review.

### **Industrial Development Standards:**

Manufacturing/industrial zoning and land uses are generally not permitted in this category. Implementing zoning may allow limited assembly and manufacturing of "craft" items such as stained glass, pottery, wood, and fabric products. Zoning for more intensive industrial use may be allowed pursuant to an approved Master Plan for the overall Community Area where adequate public infrastructure exists.

### **Agricultural Land Use Standards:**

Agricultural land uses within this category consist of light and medium agricultural uses.

Agricultural land uses located within the Community Area category may be subject to limitations with respect to animal keeping, setbacks, building height, and other regulations of the County Zoning Ordinance.

Due to potential groundwater overdraft conditions, commercial agricultural uses are prohibited in the Ocotillo-Coyote Wells groundwater basin.

### **Open Space/Recreation Standards:**

Open space land uses within this category consist of environmentally sensitive areas, fault zones, floodways and floodplains.

Recreational land uses within this category are limited to recreational vehicle parks and uses which consist primarily of outdoor facilities such as parks, athletic fields, golf courses, and swim and tennis clubs. Other more intensive commercial recreation uses may be allowed pursuant to an approved Master Plan for the overall Community Area where adequate public infrastructure exists. Due to potential groundwater overdraft conditions, only passive recreation uses are allowed in the Ocotillo-Coyote Wells groundwater basin.





### **Solid and Liquid Waste Disposal Facilities:**

Landfills and hazardous waste storage and transfer stations are not allowed within this category. Municipal solid waste transfer and recycling stations may be permitted with appropriate zoning and environmental review.

### **3. Government/Special Public**

This designation indicates lands generally owned by public agencies which are presently, and for the foreseeable future, used for a specific governmental purpose. This designation includes military bases and public parkland and may also be applied to airports, sewer and water facilities, cemeteries, and other public utilities and facilities.

#### **Federal Lands:**

The County has no jurisdiction over federally-owned lands and the use and intensity on such lands will be determined by the appropriate federal agency, such as the Department of the Navy for the Naval Air Facility and bombing ranges which are designed Government/Special Public. Also in this category are the Salton Sea, Cibola, and Imperial National Wildlife Refuges.

Land uses on Indian Reservations are also not regulated by the County. These lands, however, are generally not designated Government/Special Public. The Quechan and Fort Yuma Indian Reservations in the southeastern corner of the County are generally designated Agriculture. Portions of the Torres-Martinez Indian Reservation in the northwestern corner of the County are designated Recreation/Open Space or Urban Area.

#### **State Lands:**

Portions of four California State Parks are within Imperial County: Anza Borrego Desert State Park, Ocotillo Wells State Vehicle Recreation Area, Salton Sea State Recreation Area, and Picacho State Recreation Area. Use of these lands, which are designated Government/Special Public, are under the jurisdiction of the State Department of Parks and Recreation.

#### **County and Other Local Agency Lands:**

Existing County Parks are Sunbeam Lake, Wiest Lake, Red Hill Marina, Heber Dunes, Walker Park, and Palo Verde Park, most of which are designated Government/Special Public. Other local agency lands may also be placed within this land use category.

#### **Private Lands:**

Where private land, such as inholdings, exist within an area designated Government/Special Public, the Development Standards shall be the same as for the Recreation/Open Space category. Development of such lands shall also be evaluated for compatibility with existing and planned uses on nearby public lands.



#### **4. Industry**

Industrial land uses within this category consist of heavy manufacturing land uses located in areas with the necessary supporting infrastructure and located away from conflicting existing or planned land uses. Generally, these lands are not suitable for agricultural use and are located adjacent to major transportation systems.

The Industry category is intended to designate areas outside of existing cities where heavy industrial uses exist, such as Plaster City, or can be accommodated without impacting residential or agricultural land uses. Zoning to allow heavy industrial uses may be applied to these areas, and may also be applied to certain Specific Plan Areas, but should not be applied in other unincorporated areas of the County or in other land use designations of the General Plan.

##### **Residential Development Standards:**

Residential land uses are limited to one single family dwelling unit if appurtenant to a permitted industrial or commercial use and occupied by a caretaker, custodian, or night watchman when on the same lot as the industrial use and only upon the issuance of a conditional use permit by the Planning/Building Department or Planning Commission.

##### **Industrial Development Standards:**

Heavy manufacturing land uses.

Maximum floor area ratio not greater than 4:1 (i.e., 4 square feet of gross building area per 1 square foot of area within the lot or building site).

A minimum of 10 percent of the lot area shall be landscaped.

Building height maximum of 150 feet, except where a lesser height is required by the Airport Land Use Compatibility Plan.

Industrial uses should locate in areas where high noise levels will not impact existing or planned noise sensitive land uses.

Prior to any zone reclassification to allow industrial use, potential significant impacts associated with the proposed rezone and appropriate mitigation shall be identified pursuant to the California Environmental Quality Act (CEQA).

Industrial uses within this category should locate in areas having access to major transportation systems.

##### **Commercial Development Standards:**

General commercial land uses which are necessary to and/or supportive of permitted industrial uses. This would include agricultural and horticultural sales, and equipment sales and services for business, industrial, construction, and agricultural purposes.





Maximum floor area ratio no greater than 2:1 (i.e., 2 square feet of gross building area per 1 square foot of area within the lot or building site).

Building height maximum of 35 feet.

A minimum of 10 percent of the lot area shall be landscaped.

#### **Solid and Liquid Waste Disposal Facilities:**

Landfills are prohibited within this category.

Hazardous waste treatment, incineration, recycling, stabilization/solidification, residual repository, and transfer/storage facilities may be sited but must be consistent with the siting criteria of the Imperial County Hazardous Waste Management Plan and the County Integrated Waste Management Plan and require a conditional use permit.

#### **5. Recreation/Open Space**

The Recreation/Open Space category recognizes the unique recreational character of Imperial County and includes desert, mountain, and waterfront areas with the potential for development as public or private parks and recreation facilities in appropriate areas. Primarily, however, areas designated Recreation/Open Space are characterized by a low intensity of human utilization and include mountain areas, sand dunes, desert lands and other open lands that are essentially unimproved and not predominantly used for agriculture. The majority of the land in this category is public land administered by the U.S. Bureau of Land Management (BLM) and owned by either BLM or the U.S. Bureau of Reclamation.

Recreation-related uses include mobilehome and recreational vehicle parks, and resort and recreation facilities. Development is a mixture of seasonally and permanently occupied residential units, recreation facilities, community facilities, and neighborhood commercial activities. Examples include Sunbeam Lake, Imperial Lakes, Rio Bend, Red Hill Marina, Goldrock Ranch, and Colorado River camps such as Mitchell Camp and Walter's Camp. Additional recreation sites potentially include the New and Alamo Rivers, and the Salton Sea. These waters, however, must be cleaned up before they can be promoted as recreational resources so as not to jeopardize the health and safety of users.

Uncontrolled desert residential development has occurred in this area in past; examples are Imperial Gables and Milpitas Wash areas in northeastern Imperial County where no water, sewer, electrical, or telephone services exist. Further development of this type shall be restricted to dwellings in compliance with the Uniform Building Code and which can be supported by adequate public access, potable water, and sewage disposal satisfactory to the County Environmental Health Services Division.

Some areas designated Recreation/Open Space contain soils suitable for agriculture, such as the East and West Mesa and Pilot Knob Units of Imperial Irrigation District, which are predominately owned by the Bureau of Land Management and not presently improved for agricultural cropland. Other areas designated Recreation/Open Space may be suitable for aquaculture, particularly where favorable





groundwater conditions exist. Agricultural uses are, therefore, permitted in the Recreation/Open Space category.

The Recreation/Open Space category also includes lands for the preservation of natural resources; areas for the recharge of groundwater basins; rivers and lakes which are important as wildlife habitat and for the enjoyment of recreational sportfishing; areas for the conservation and managed production of mineral resources; and areas for the preservation of areas of outstanding scenic, historic and cultural value. It is intended that this category also be used to protect public health and safety, including areas that require special management or regulation because of hazardous or special conditions such as earthquake fault zones, unstable soils, floodplains, watersheds, and other areas required for the protection of water quality.

#### **Residential Development Standards:**

Low density land uses with not more than 1 single family dwelling per 20 acres. Greater densities may be permitted by Specific Plan encompassing at least 160 acres for appropriate recreation-oriented residential development where adequate facilities and services for such use exist or can be provided.

Residential building intensity is determined by available public facilities and services and other factors which may affect the site.

An on-site potable water supply and sewage disposal satisfactory to the County Health Department.

Maximum building height of 35 feet.

No lot shall have more than 50 percent of its net area covered with buildings or structures.

#### **Agricultural Land Use Standards:**

Light to medium agricultural land uses including row and field crops, orchards, aquaculture, grazing, and apiaries where groundwater resources (or imported water) are adequate to support agricultural production without impact to existing domestic water wells or community water supplies.

Agricultural uses are prohibited on all areas administered by the BLM and the U.S. Fish and Wildlife Service, and on private lands that are inholdings in "Areas of Critical Environmental Concern" (ACEC).

#### **Open Space/Recreation Standards:**

Open space land uses within this category consist of environmentally sensitive areas, fault zones, floodways and floodplains, undeveloped desert lands, parks, and areas designated for the managed production of natural resources.



Recreational land uses within this category are limited to recreational vehicle parks and uses which consist primarily of outdoor facilities such as parks, athletic fields, golf courses, swim and tennis clubs, and off-road vehicle use areas.

Intensive recreational development within this category is prohibited in areas designated by BLM as "Areas of Critical Environmental Concern" or in a National Wildlife Refuge. These areas will be preserved in the General Plan for biological resources. Unauthorized entry is prohibited by the U.S. Fish and Wildlife Service into a National Wildlife Refuge.

#### **Solid and Liquid Waste Disposal Facilities:**

Landfills and hazardous waste facilities are not allowed within this category, with the exception of maintaining existing facilities.

### **6. Rural Residential**

The Rural Residential category represents predominately low density residential and recreational land uses in areas where public water and sewer service is limited or non-existent. Permitted development within this category is based upon the availability of public services and facilities, the adequacy of the circulation system, and compatibility with the existing and planned adjacent development.

The only area designated as Rural Residential by the Land Use Plan of this Revised (1993) General Plan is adjacent to the Hot Mineral Spa area. Other areas suitable for Rural Residential land uses may be designated in the future.

#### **Residential Development Standards:**

Residential land uses at a population density from 1 dwelling unit per 5 acres to a maximum of 2 dwelling units per net acre.

Residential building intensity is determined by available public facilities and services and other factors which may affect the site.

A minimum lot size of 20,000 square feet (net area exclusive of road and other easements) is established for single family homes where sewer service is not presently available. A larger lot size may be required for an on-site sewage disposal system to be approved by the County Environmental Health Services Division.

An on-site potable water supply approved by the County Health Department is required for all residential development.

A site-specific geohydrology study is required if a proposed residential subdivision is to be served by groundwater.

Maximum building height is 35 feet for single family homes.





### **Commercial Development Standards:**

Light intensity commercial land uses such as neighborhood commercial uses.

A site-specific geohydrology study is required if a proposed commercial development is to be served by groundwater.

Maximum floor area ratio not greater than 1:1 (i.e., 1 square foot of gross building area per 1 square foot of area within the lot or building site).

Building height maximum of 35 feet.

A minimum of 10 percent of the lot area shall be landscaped.

### **Industrial Development Standards:**

Manufacturing/industrial zoning and land uses are not permitted in this category.

### **Agricultural Development Standards:**

Agricultural land uses within this category consist of light and medium agricultural uses.

Agricultural land uses located within the Rural Residential category may be subject to limitations with respect to animal keeping, setbacks, building height, and other regulations of the County Zoning Ordinance.

### **Open Space/Recreation Standards:**

Open space land uses within this category consist of environmentally sensitive areas, fault zones, floodways and floodplains, and parks.

Recreational land uses permitted within this category are limited to recreational vehicle parks and uses which consist primarily of outdoor facilities such as parks, athletic fields, golf courses, and swim and tennis clubs, except in areas identified as environmentally sensitive.

### **Solid and Liquid Waste Disposal Facilities:**

Landfills and hazardous waste storage and transfer stations are not allowed within this category. Municipal solid waste transfer and recycling stations may be permitted with appropriate zoning and environmental review.

### **7. Special Purpose Facility**

This designation may be applied to lands which are necessary for basic governmental services which have physical or operational characteristics incompatible with most other land use categories. In particular, noise, odors, air and water quality impacts, aesthetics, and traffic may create dangerous or objectional conditions.



Permitted uses are subject to approval of a Conditional Use Permit and include Class I, II, and III solid and liquid waste facilities, prisons, and general aviation airports, or sites approved for those purposes. It is the intent of this designation that such proposed and existing facilities be protected from encroachment by development or incompatible land uses.

#### **Solid Waste Facility Development Standards:**

All new solid waste facilities, including all classes of landfills, which receive local and state approval shall be placed within this category through a General Plan Amendment, if not already so designated and operating in conformance with an approved Conditional Use Permit. The designation shall include all contiguous or adjacent lands owned or otherwise controlled by the individual, corporation, or other entity which owns, operates, or proposes to own or operate, the landfill in order to provide an adequate buffer from other land uses. The minimum required buffer for any area proposed for the permanent placement of solid waste (i.e., the actual landfill portion of the facility) shall be 1,320 feet (one-quarter mile) from any lands not owned or controlled by the landfill owner or operator. Where public lands dedicated to open space uses or landfill related industrial development or mining operations are located within the said 1,320 feet, the buffer may not be required as determined by the public agency. The potential long term environmental impacts to the neighboring land uses or development may be considered in making this determination.

All solid waste facilities shall conform to the County Integrated Waste Management Plan (COIWMP), when adopted, and shall be subject to approval of a conditional use permit pursuant to the County Zoning Ordinance which shall specify standards for the establishment, operation, and closure of such facility and related or buffer-area land uses. Additional review and approval is required from the California Integrated Waste Management Board (CIWMB) and the County of Imperial Health Department acting as the Local Enforcement Agency (LEA) designated by the CIWMB. Review and/or approval by the following agencies is also required in most cases: Imperial County Air Pollution Control District, County Department of Public Works, State Water Resources Control Board, State Air Resources Board, State Department of Fish and Game, U.S. Environmental Protection Agency, and U.S. Fish and Wildlife Service. Due to the large amount of land in Imperial County under the control of the U.S. Bureau of Land Management, approval by that agency may also be required.

#### **Related Landfill Facilities:**

In addition to the landfill itself, the solid waste facility may include necessary and incidental support and operations facilities including intermodal transfer facilities (e.g., from rail line to truck), equipment repair, maintenance, and storage, administration and employee buildings, fueling and petroleum products storage, water reclamation and treatment facilities, landfill gas and energy recovery facilities, electrical substation, and water storage tanks or reservoirs.





### **Other Permitted Uses:**

Other uses may be permitted within the Special Purpose Facility land use designation which provide a necessary governmental or public service use not appropriate in other land use designations or for which suitable land is not adequately available.

Also permitted are uses which are appropriate, supportive, or compatible with the principal Special Purpose Facility use of the site. Such uses shall be described in the conditional use permit and other local, state, and federal approvals as may be required and may include: commercial, industrial, agricultural uses; facilities operated by public agencies or public utilities, geothermal facilities, solid waste sorting, recovery, and recycling facilities; mining and processing of mineral, aggregate, or other natural resources; private or public parks or recreation facilities; employee residences where not subject to adverse air quality or other impacts incompatible with residential use.

### **8. Specific Plan Area**

The Specific Plan Area (SPA) designation may be used where a Specific Plan has been approved or must be approved prior to development. Land within this category usually has environmental constraints or unique land use concerns or opportunities which require special land use and/or design control. Suitable areas may also include lands proposed for large-scale urban development, for natural resource protection or historic preservation, or other use requiring more detailed planning than would typically be required by the County Zoning or Subdivision Ordinances.

### **Development Standards:**

Application of the Specific Plan Area designation shall be accompanied by adoption of Objectives and Policies for the design, development, and use of such areas. This may include residential, commercial, industrial, agricultural, recreational, open space, and public uses. Except as provided below, once land is designated as a Specific Plan Area no use other than agriculture may be established and no major or minor tentative subdivision map or zone reclassification to a more intensive zone shall be approved except in accordance with an approved Specific Plan. Future development within the vicinity of the Holtville Airport shall not preclude the long-term viability of the airstrip to be developed as a regional airport.

### **Interim Uses:**

Prior to the approval of a Specific Plan, land within this category may be used for agriculture unless such interim use is specifically prohibited by the Objectives and Policies of the particular Specific Plan Area. Other interim uses may be permitted by the County Board of Supervisors which are consistent with the Goals and Objectives of the General Plan upon specific findings clearly showing consistency. Interim uses are subject to Zoning Ordinance and CEQA review and such conditions of approval as are necessary or appropriate.

### **9. Urban Area**





The Urban Area classification is intended to provide for low to high density residential, commercial, and industrial development, and associated public services. Most Urban Area classifications surround the incorporated cities of Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmorland; but are also used for the unincorporated communities of Heber, Niland, Seeley, West Shores/Salton City, and Winterhaven. These areas are characterized by a full level of urban services, in particular public water and sewer systems, and contain or propose a broad range of residential, commercial, and industrial uses.

It is anticipated that these areas will eventually be annexed or incorporated and should be provided with the full range of public infrastructure normally associated with cities. Therefore, development in these areas shall provide for the extension of full urban services such as public sewer and water, drainage improvements, street lights, fire hydrants, and fully improved paved streets with curbs and, in most cases, sidewalks. Such improvements shall be consistent with City standards as determined by the City Engineer, Department of Public Works, Fire Marshal, and Planning/Building Department.

All development within Urban Areas shall also be reviewed by affected local agencies and County departments to determine that an adequate level of public services exist to serve the proposed project. This would include the off-site circulation system (County Department of Public Works), adequate water and pressure for fire suppression (County or City Fire Marshal), police services (County Sheriff or City Police Department), schools (local school district and County Department of Education), potable water (local water district), sewage disposal (local sanitation district or County Health Department), local park facilities (County Parks and Recreation Department), and other services which the Planning/Building Department identifies as impacted. In areas potentially affected by airport operations, developments shall be reviewed for conformance to the Airport Land Use Compatibility Plan.

#### **Residential Development Standards:**

Residential land uses at a population density of 1 to a maximum of 29 dwelling units per acre.

Residential building intensity is determined by available public facilities and services and physical or environmental factors which may affect the site.

New residential development must be consistent with the existing character of the community.

New residential development within the vicinity of airports must be consistent with the Airport Land Use Compatibility Plan

#### **Commercial Development Standards:**

Low to high intensity commercial land uses including professional offices, neighborhood and general commercial uses.

Maximum floor area ratio not greater than 2:1 (i.e., 2 square feet of gross building area per 1 square foot of area within the lot or building site).



Building height maximum of 50 feet or as provided by the Airport Land Use Compatibility Plan.

A minimum of 10 percent of the lot area shall be landscaped. A greater percentage of landscaping may be required for projects involving discretionary review.

New commercial development within the vicinity of airports must be consistent with the Airport Land Use Compatibility Plan.

#### **Industrial Development Standards:**

Light and medium industrial land uses.

Maximum floor area ratio not greater than 3:1 (i.e., 3 square feet of gross building area per 1 square foot of area within the lot or building site).

Building height maximum of 50 feet or as provided by the Airport Land Use Compatibility Plan.

Industrial uses should locate in areas where high noise levels will not impact existing or planned noise sensitive land uses.

Significant impacts associated with the proposed land use must be mitigated.

Industrial land uses within this category should locate in areas having access to major transportation systems.

A minimum of 10 percent of the lot area shall be landscaped. A greater percentage of landscaping may be required for projects involving discretionary review.

New industrial development within the vicinity of airports must be consistent with the Airport Land Use Compatibility Plan.

#### **Agricultural Land Use Standards:**

Agricultural land uses within this category consist of light and medium agricultural uses.

Agricultural land uses located within the Urban Area category may be subject to limitations with respect to animal keeping, setbacks, building height, and other regulations of the County Zoning Ordinance.

#### **Open Space/Recreation Standards:**

Open space land uses within this category consist of environmentally sensitive areas, fault zones, floodways and floodplains, and agricultural lands. Recreational land uses within this category consist of both outdoor and indoor facilities such as parks, athletic fields,





recreational vehicle parks, and commercial sports enterprises such as golf courses, health and athletic clubs, and bowling alleys.

#### **Solid and Liquid Waste Disposal Facilities:**

Landfills and hazardous waste storage and transfer stations are prohibited within this category.

Solid waste transfer and recycling stations may be permitted with appropriate zoning and environmental review.

#### **D. Compatibility Matrix**

The primary purpose of a compatibility matrix is to provide a means to evaluate and achieve compatibility between the general plan and zoning ordinance. A matrix can be used to compare the land use categories of the general plan with the zoning districts and corresponding development standards of the Zoning Ordinance.

To illustrate the extent of zoning compatibility with the general plan, the Imperial County Consistency Matrix features the following categories:

- Compatible: Zones that are compatible with the General Plan Designation
- Incompatible: Zones that are not compatible with the General Plan Designation
- Conditionally Compatible: Zones that the County could find compatible under certain circumstances, but that generally are not compatible

The conditionally compatible category is zoning that is not by itself compatible, but could be found to be compatible under unique or unusual circumstances. Such circumstances would include zoning needed to accommodate an existing legal or legal non-conforming use; when additional density or use restrictions can be included by use of an "overlay" or "combining" zone; or where a Specific Plan, conditional use permit (CUP) or other discretionary permit can be required for a proposed use and mitigating measures can be imposed to reduce or eliminate potential land use conflicts.



**TABLE 4**  
**COMPATIBILITY MATRIX**

Land Use Categories	Zones																							
	R-1	R-1-T	R-2	R-3	R-4	R-4-T	R-A	A-1	A-2	A-2-R	A-3	C-0	C-1	C-2	M-1	M-2	F	K	D	N	W	S	G	L
Agriculture	■	■	■	■	■	■	■	■	○	○	○	■	●	●	■	■	●	○	■	■	○	●	○	■
Community Area	○	○	●	●	●	●	●	●	○	■	■	○	○	■	●	■	○	■	○	○	○	○	○	○
Government/ Special Public	■	■	■	■	■	■	■	■	○	○	○	■	■	■	■	■	○	●	■	■	○	○	○	■
Industry	■	■	■	■	■	■	■	■	●	●	●	●	●	●	○	○	■	○	○	○	○	○	○	○
Recreation/ Open Space	■	■	■	■	■	■	■	■	○	○	○	■	●	■	■	■	○	●	■	■	○	○	○	■
Rural Residential	■	■	■	■	■	■	■	○	●	●	●	■	●	■	■	■	○	■	○	○	○	○	○	○
Special Purpose Facility	■	■	■	■	■	■	■	■	●	●	●	■	■	■	■	●	■	●	●	●	●	●	●	●
Specific Plan Area	●	●	●	●	●	●	■	■	○	●	●	●	●	●	●	●	●	●	○	○	○	○	●	●
Urban Area	○	○	○	○	○	○	■	○	●	■	■	○	○	○	○	■	●	○	○	○	○	○	○	○



## **E. Implementation Policies and Programs**

Implementation of the Land Use Element is intended to be a continual process involving amendments to the County Zoning Ordinance and Zoning Maps, and discretionary review of proposed subdivisions and conditional use permits; and also involving ministerial review procedures to assure that proposed development has adequate potable water and sewage disposal, and to determine that no hazard to public health or safety will result from flooding, earthquakes, unstable soil, or other natural hazards.

### **1. Agriculture**

#### **Policy**

Residential encroachment into agricultural areas has resulted in land use conflicts and potentially unhealthful conditions for residents due to tilling of fields and use of farm chemicals on crops. This situation also often leads to reduction in agricultural production due to complaints from new residents. The County strongly supports continued agricultural use of all areas designated "Agriculture" and exclusion of incompatible residential uses.

#### **Program**

- Existing areas designated Agriculture which are zoned R-A or A-1 will not be considered in conformance with the Agriculture land use designation and should be rezoned to the A-2 or other existing or new agricultural zone which requires a minimum lot size of 40 acres.

#### **Policy**

Over 50 old subdivisions, most in agricultural areas, have the potential to develop with incompatible residential uses. If this occurs, land use conflicts and complaints from new residents are likely to result. Procedures should be established to assure that residential development of old subdivisions do not result in conflicts with continued agricultural use.

#### **Program**

- Evaluate existing zoning of all old subdivisions in areas designated Agriculture. Consider creation of a new zone or overlay zone which would permit residences only if specific findings are made by the Board of Supervisors that continued agricultural use of surrounding lands will not be impacted and that adequate public infrastructure exists to support residential use, including on- and off-site roads, sewage disposal, and potable water.

### **2. Industry**

#### **Policy**

New industrial development is essential to maintaining a viable County economy. Areas designated Industry or planned for industrial development, such as the Mesquite Lake SPA, need to be protected from incompatible surrounding development, in particular residential.





## **Program**

- Review existing zoning within and adjacent to areas designated Industry. Agricultural zones, with a prohibition on residential development, are preferred adjacent to Industry. Prohibit new residences within areas designated Industry except for managers or caretakers. Where existing or planned residential areas are adjacent to industrial areas, require light industrial uses as a transition zone on the perimeter of planned industrial areas.

## **3. Urban Areas**

### **Policy**

A primary concern for new development in Urban Areas, particularly those which are adjacent to incorporated cities, is the adequacy of existing public services and facilities, and the level of infrastructure improvements proposed by new development.

### **Program**

- All proposed subdivision development and new multiple family, commercial, and industrial development within the Urban Area category, shall be required to provide full public street and drainage improvements, including the installation of curb and gutter, sidewalks, sewers and potable water. Such improvements shall comply with that City's design and improvement standards.

### **Policy**

Existing County zoning regulations in agricultural, commercial, and industrial zones enable residential development which conflicts with planned uses envisioned by the General Plan and results in land use conflicts and loss of potential County fiscal benefits from lands zoned for commercial or industrial uses.

### **Program**

- County zoning maps shall be amended to conform to the Urban Area designation; and the County Zoning Ordinance shall be amended to prohibit residential as a principal use in commercial and industrial zones.



## APPENDIX A

### LIST OF ORGANIZATIONS AND PERSONS CONSULTED

#### Local:

Airport Land Use Commission  
Bombay Beach Community Service District  
Brawley School District  
Brawley Union School High School District  
Brawley, City of  
Brawley, City of, Library  
Calexico Unified School District  
Calexico, City of, Planning Department  
Calexico, City of, Library  
Calipatria Unified School District  
Calipatria, City of  
Central High School District  
County of Imperial, Airport/Real Property, Dan Pavao, Manager  
County of Imperial, Assessors Office, Jose Rodriquez  
County of Imperial, Building Board of Appeals, Chairman  
County of Imperial, Buildings and Grounds Department/Parks and Recreation Department, Randy Rister  
County of Imperial, County Counsel Office, Joanne Yeager, Assistant County Counsel  
County of Imperial, Department of Health Services, Environmental Health Services, Tom Wolf  
County of Imperial, Department of Public Works, S. Harry Orfanos, Director  
County of Imperial, Fire Department/Office of Emergency Services, Nicanor Benavidez, Chief  
County of Imperial, Library, Berita Fulmer  
County of Imperial, Office of Education  
County of Imperial, Office of the Agricultural Commissioner, Steve Birdsall  
Coyote Valley Mutual Water Company  
El Centro School District  
El Centro, City of, Planning Department  
El Centro, City of, Library  
Farm Bureau  
Heber Public Utilities District  
Heber School District  
Holtville Unified School District  
Holtville, City of  
Imperial County Association of Realtors  
Imperial Irrigation District, Charles L. Shreves, Manager  
Imperial Irrigation District, Chairman, Board of Directors  
Imperial Irrigation District, Water Department, Jesse Silva  
Imperial Irrigation District, Power Department, Hank Legaspi  
Imperial Unified School District  
Imperial Valley College Museum, Jay C. Von Werlhoff, Archaeologist





Imperial Valley College, Hector Lopez, Ph.D.,  
Imperial, City of  
Kiwanis Early Risers Club of El Centro  
Local Agency Formation Commission, Chairman  
Magnolia Union School District  
McCabe Union School District  
Meadows Union School District  
Mulberry School District  
Niland Chamber of Commerce  
Ocotillo Community Council  
Ocotillo Mutual Water Company  
Palo Verde Homeowners Association  
Regional Economic Development, Inc.  
Rotary Club of El Centro  
Salton Community Services District  
Salton Sea Fish and Wildlife Club  
San Diego State University, Imperial Valley Campus  
San Pasqual Valley Unified School District  
Seeley County Water District  
Seeley Union School District  
The Great Salton Sea Experience  
Westmorland Union School District  
Westmorland, City of  
Winterhaven County Water District

**State:**

State of California, Office of the Governor, Office of Local Government Affairs, Antero A. Rivasplata, Principal Planner  
State of California, Caltrans, District 11, Bob Corbin, Civil Engineer  
State of California, Department of Conservation, Division of Mines and Geology/Farmland Mapping and Monitoring Program  
State of California, Department of Corrections, Planning and Construction Division,  
State of California, Department of Finance, Population Research Unit  
State of California, Department of Fish and Game, John Thompson, Wildlife Biologist  
State of California, Department of Fish and Game, Kimberly Nicol, Fishery Biologist  
State of California, Department of Fish and Game, Ronald E. Powell, Wildlife Manager Biologist  
State of California, Department of Health Services, Office of Noise Control  
State of California, Department of Resources, State Mining and Geology Board  
State of California, Employment Development Department, Employment Data and Research  
State of California, Regional Water Quality Control Board, Colorado River Basin  
State of California, State Lands Commission

**Federal:**

Bureau of Indian Affairs  
Quechan Indian Tribe



Torres-Martinez Indian Reservation  
U.S. Army Corps of Engineers  
U.S. Customs Service  
U.S. Department of Agriculture, Soil Conservation Service  
U.S. Department of Commerce, Bureau of the Census  
U.S. Department of the Interior, Bureau of Land Management, El Centro Resource Area  
U.S. Department of the Interior, Bureau of Reclamation  
U.S. Fish and Wildlife Service, Calipatria  
U.S. Marine Corps Air Station, Yuma  
U.S. Naval Air Facility, El Centro

**Regional:**

AT&T  
Coachella School District  
Coachella Valley Water District  
Pacific Bell  
Palo Verde Water District  
Riverside, County of, Planning Department  
San Diego Gas and Electric, San Diego  
San Diego, County of, Planning Department  
Southern California Association of Governments  
Southern California Edison  
Southern California Gas Company  
Yuma, City of  
Yuma, County of  
Yuma Valley Water District

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circulation and scenic highways element

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## **IMPERIAL COUNTY GENERAL PLAN CIRCULATION AND SCENIC HIGHWAYS ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

This revision of the Circulation and Scenic Highways Element is prepared as part of the current General Plan Update and in response to new state guidelines and modified population and transportation projections. The County of Imperial is doing so in conjunction with the Southern California Association of Governments (SCAG) "Regional Mobility Plan" and other related transportation planning documents.

A circulation element is a mandatory element of the general plan pursuant to Section 65302(b) of the State Government Code. The inclusion of scenic highways is optional under state law and is being included by the County of Imperial as the initial step in providing a highway system offering unique scenic experiences. Designation of scenic highways provides the policy framework to guide the implementation of a scenic highways program and establishes the basic actions needed to move the program forward. Conscientious implementation of this program including the judicious application of scenic highway standards should lead to the protection of existing scenic resources and the enhancement of those areas in which scenic resources have been lost due to the lack of controls.

#### **B. Purpose of the Circulation and Scenic Highways Element**

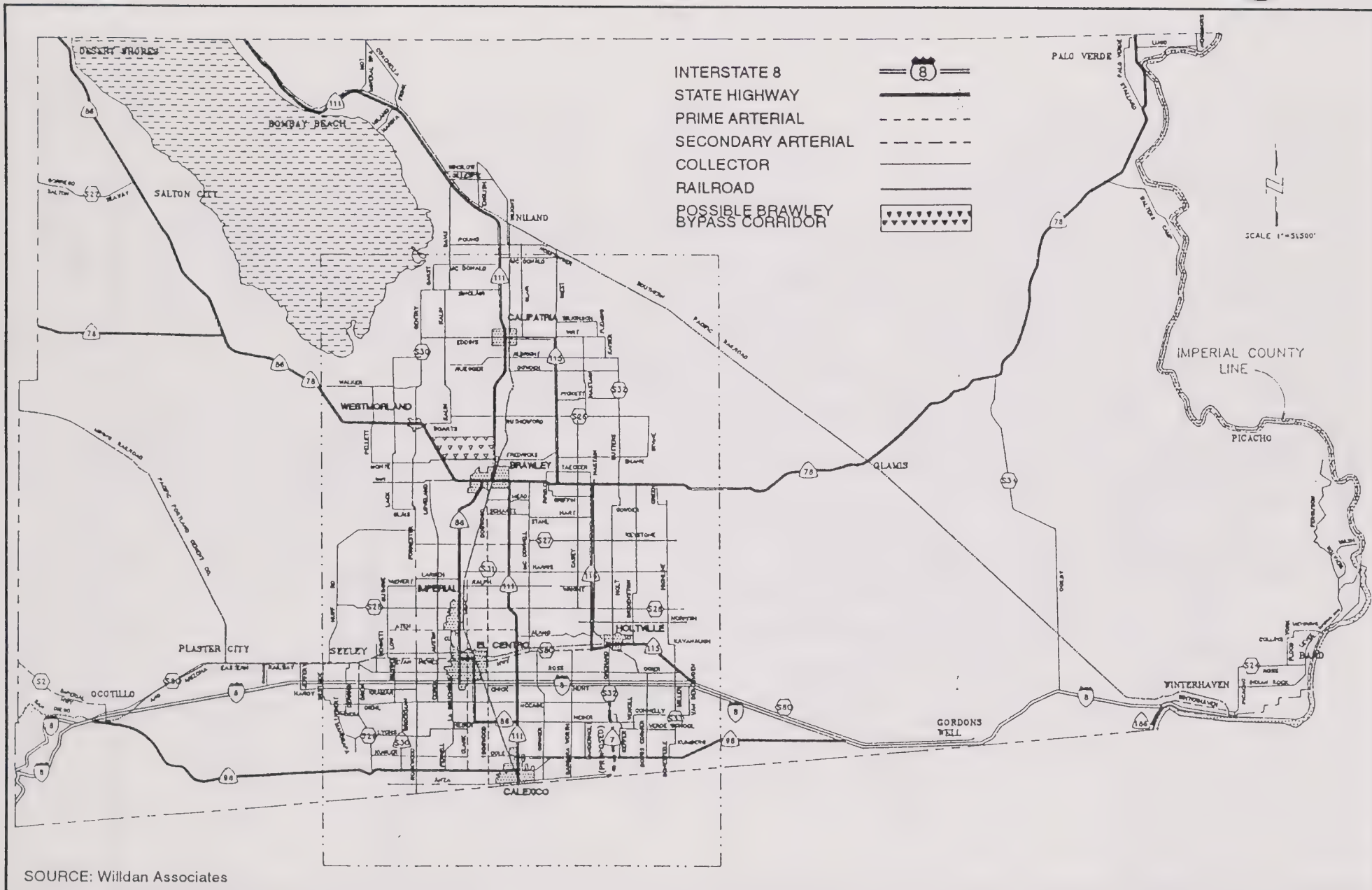
The purpose of this element is to provide a comprehensive document which contains the latest knowledge about the transportation needs of the County and the various modes available to meet these needs. It is provided to meet the information needs of local residents, for regional coordination, and pursuant to requirements of law and policies of federal, state, and regional agencies. Additionally, the purpose of this Element is to provide a means of protecting and enhancing scenic resources within both rural and urban scenic highway corridors.

The County, through the Department of Public Works, administers and coordinates the development of local transportation resources, financing and road maintenance in a manner compatible with local land use planning, development patterns and the environment. An important County goal is to provide leadership, staff, and liaison with local and regional permitting and regulatory agencies in order to prepare plans, regulations and standards which can facilitate the transportation network development process.

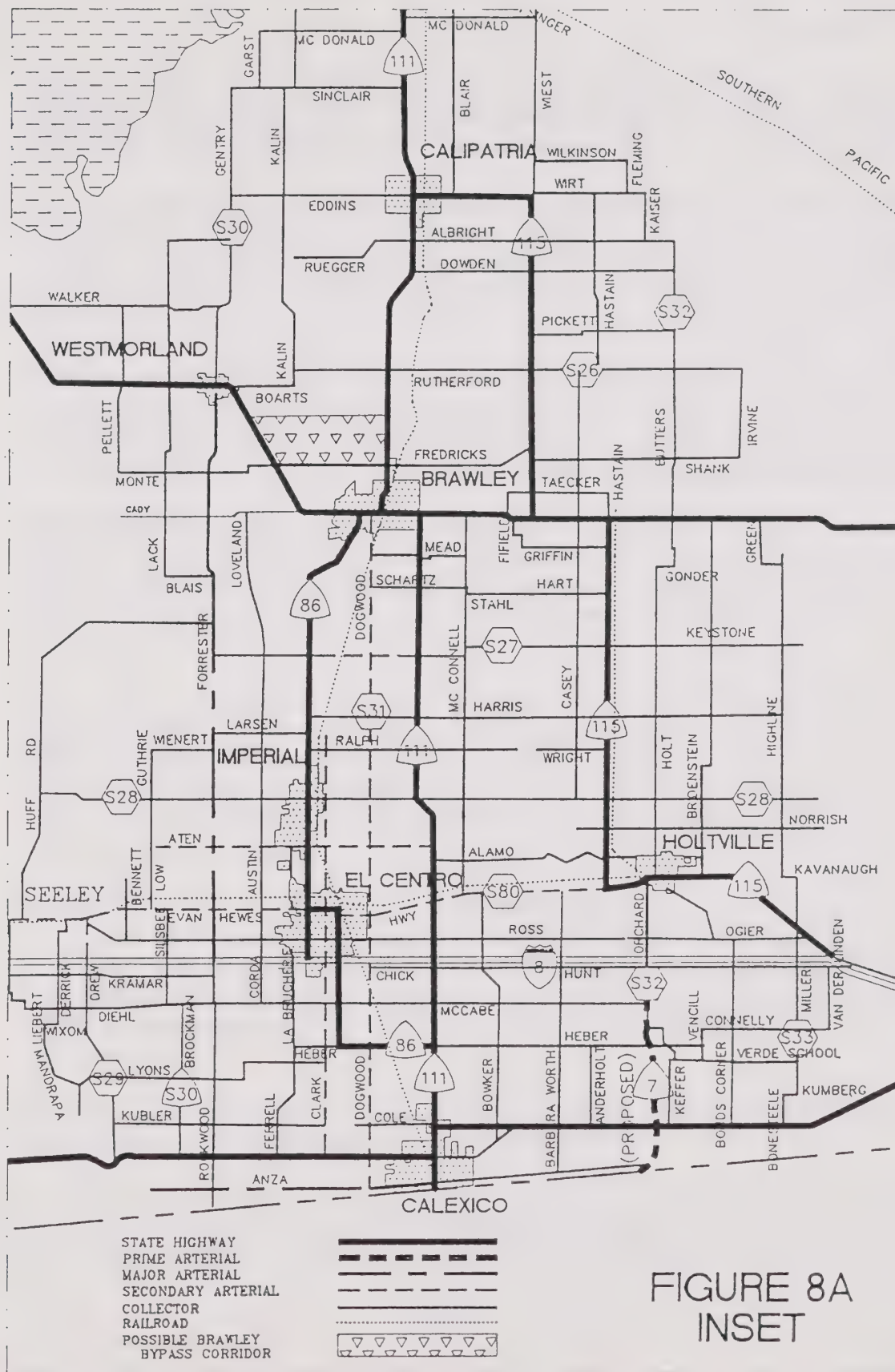
#### **C. Roadway Classification System**

This Element and the accompanying Circulation and Scenic Highways Plan (Figure 1) establish the following classification of existing and planned roadways:









SOURCE: Willdan Associates

Imperial County  
General Plan

Circulation Plan Inset

Circulation and Scenic Highways Element

Figure  
2



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**Prime Arterial** — the main function of this classification is to provide regional, subregional, and intra-county travel services. Features include high design standards with four to six travel lanes, raised and landscaped medians, highly restricted access, and no parking.

**Major Arterial** — these provide intra-county and subregional service. Access and parking may be allowed, but closely restricted in such a manner as to ensure proper function of this roadway. Typical standards include the provision for four and six travel lanes with raised and landscaped medians for added safety and efficiency by providing protected left turn lanes at selected locations.

**Secondary Arterial** — these are designed for intra-county travel as a link between the long haul facilities and the collector/local facilities. Although it frequently provides direct access to abutting properties, that is not its primary purpose. Typical design features include provision for four travel lanes without a raised median. Parking is generally not permitted.

**Collector Street** — this is designed to connect local streets with the adjacent arterial street system. Design standards include provision for two travel lanes and parking, except in specific locations where parking is removed to provide a turn lane at intersections. Collector streets frequently provide direct access to abutting properties, although that should be avoided where feasible.

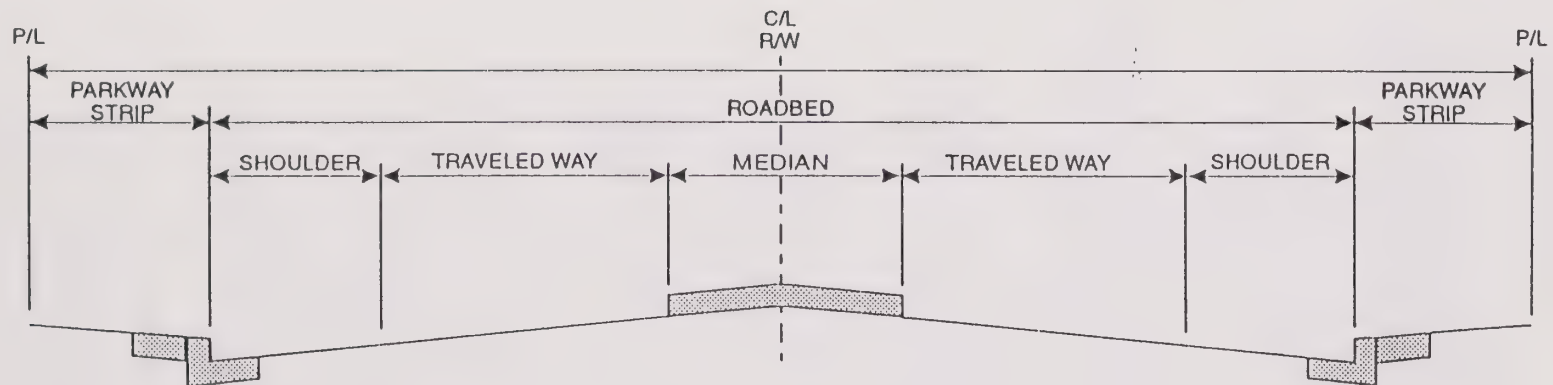
**Local Street** — this street is designed to provide direct access to abutting properties and to give access from neighborhoods to the Collector Street system. In the central Imperial Valley, local streets have historically been created along section and half-section lines forming a north/south and east/west grid. This local street network provides alternative routes to connect with Collector and Arterial streets. Design standards include provision for two travel lanes and parking.

**Residential Street** - this street type also includes residential cul de sac and loop street and is designed to provide direct access to abutting properties and to give access from neighborhoods to the Local Street and Collector Street system. This classification should be discontinuous in alignment such that through trips are discouraged. Typical design standards include provision for one travel lane in each direction, parking on both sides, and direct driveway access.

A roadway cross-section illustrating the right-of-way, paved width, and other features of the street classification system is shown on Figure 2.

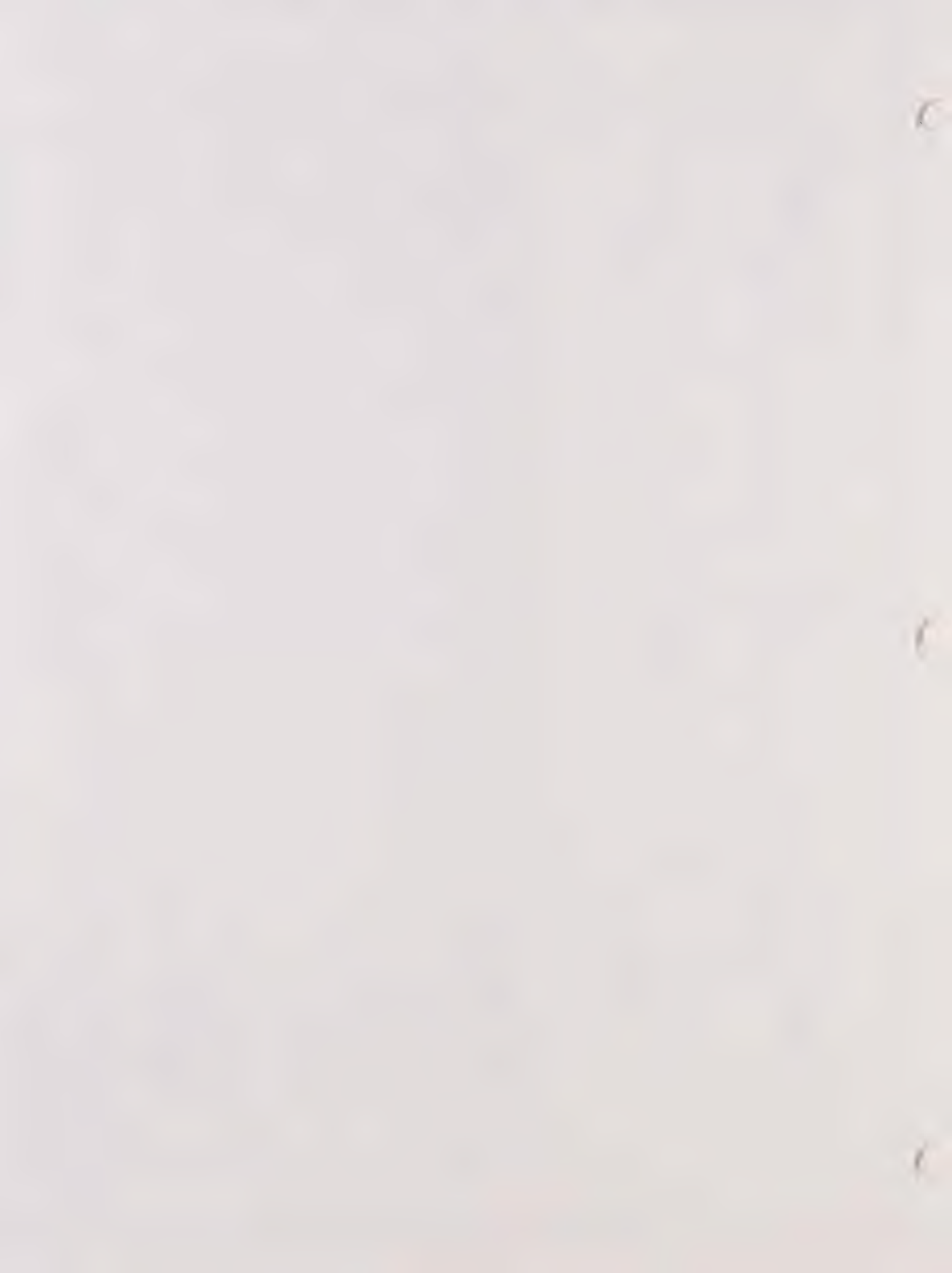
In addition, the designation of Scenic Highway has been placed on specified roadways in the County and may be added to others in the future. The purpose of this designation is to protect and enhance the County's scenic aesthetic resources which are visible from major County and State routes.





CORRIDOR CLASSIFICATION	MEDIAN	TRAVELED WAY	SHOULDER	PARKWAY STRIP	ROADBED	R/W
PRIME ARTERIAL	18	36	8	10	106	126
MAJOR ARTERIAL	18	24	8	10	82	102
SECONDARY ARTERIAL	0	24	8	10	64	84
COLLECTOR	0	12	8	15	40	70
LOCAL STREET	0	12	8	10	40	60
RESIDENTIAL STREET	0	12	8	10	40	60
RESIDENTIAL CUL-DE-SAC OR LOOP STREET	0	12	8	10	40	60

SOURCE: Willdan Associates





## II. EXISTING CONDITIONS AND TRENDS

### A. Preface

Willdan Associates was retained by the County of Imperial to prepare and evaluate the potential transportation impact which may occur as part of the Land Use Element included with the County General Plan update program which was commenced in 1992. The following information on existing conditions is based on the Willdan report.

### B. Existing Conditions

#### 1. State Highways

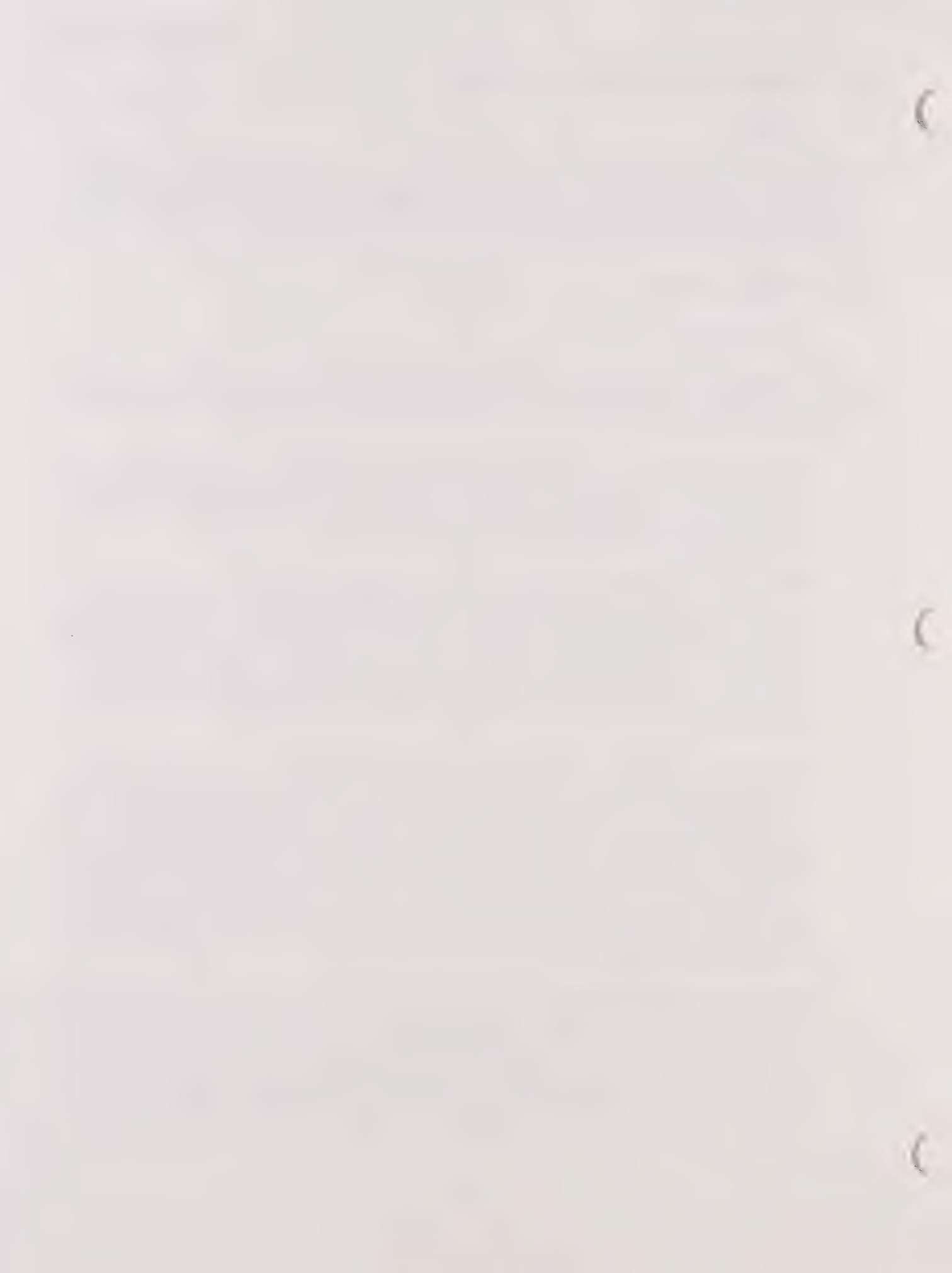
Existing regional access to the County of Imperial is provided via Interstate 8, State Route 111, State Route 78, State Route 86, State Routes 115, and State Route 186. The existing conditions of these routes are described below:

**Interstate 8 (I-8)** is the primary east/west route through the County between San Diego and Yuma, Arizona. It is constructed with two travel lanes in each direction with complete grade separation at all intersections. The volumes on this facility range between 6,200 average daily trips (ADT) to 22,900 ADT.

**State Route 111 (SR-111)** commences at the international border at Calexico and consists of two travel lanes in each direction north to I-8. Traffic volumes on these segments range between 22,000 and 41,000 ADT. North of I-8, SR-111 narrows to a two lane undivided roadway providing connection to Brawley, Calipatria, and along the eastern shore of the Salton Sea to the Riverside County city of Indio where it connects with I-10. Daily traffic volumes north of I-8 range are 12,100 ADT, decreasing to 3,500 ADT south of the Riverside County line.

**State Route 86 (SR-86)** is generally a north/south route, primarily constructed with two travel lanes in each direction. This facility runs from I-10 in Indio, parallels the western side of the Salton Sea, joins with SR-78 south of Salton City, continues through Westmorland to Brawley, then splits from SR-78 and continues south through Imperial and El Centro to I-8. South of I-8, it serves the community of Heber and terminates at SR-111. Daily traffic volumes on SR-86 in the unincorporated portions of the County vary between 4,100 ADT (north of SR-78) to 13,500 ADT south of Brawley. Ultimately, Caltrans has plans to widen and realign SR-86 to four lane conventional highway and expressway standards between I-8 and the Riverside County line.

**State Route 78 (SR-78)** commences at I-10 at Blythe in Riverside County, traverses Imperial County in an east/west fashion through Palo Verde, Brawley, and Westmorland, and continues through San Diego's north county before terminating at I-5. Most sections of SR-78 are constructed as a two-lane conventional highway (one travel lane in each direction) with the exception of a 1.8 mile section through the incorporated city of Brawley. Outside Brawley, SR-78 tends to carry very low traffic volumes ranging between 600 ADT east of



the San Diego County line, to 5,300 ADT just west of the City of Brawley. The portion of SR-78 east of Brawley to the Riverside County line carries daily traffic volumes ranging from 1,300 ADT to approximately 3,500 ADT. Caltrans is studying a new alignment for SR-78 which would bypass Brawley on the north as shown on Figures 1 and 2.

**State Route 98 (SR-98)** is an east/west facility separating from Interstate 8 near the community of Ocotillo, traversing in a southeasterly fashion through the City of Calexico and reconnecting to I-8 near the Algodones Sand Dunes. The majority of SR-98 is currently constructed with one travel lane in each direction, with the exception of a 2.2 mile stretch within the city of Calexico which provides two travel lanes in each direction. Daily traffic volumes on this facility range from 700 ADT west of the eastern connection of this route to I-8 to 10,500 ADT just west of the Calexico western city limits. With implementation of proposed SR-7 between the new East Border Crossing and SR-98, Caltrans is proposing to relocate SR-98 through the City of Calexico on a more northerly alignment using Cole Road, which would be upgraded from two to four travel lanes. This change will require concurrence by the City of Calexico, the County, and Caltrans.

**State Route 115 (SR-115)** is a north/south two-lane undivided highway (with a few four-lane sections along its route) and primarily serves travel north of I-8 to Holtville, Brawley, and Calipatria. Existing daily traffic volumes range between 1,200 ADT and 5,800 ADT.

**State Route 186 (SR-186)** is a short north/south facility connecting I-8 to the southeastern portion of Imperial County and the Mexican border community of Algodones. SR-186 accommodates international travel and commercial travel. Currently, this roadway is constructed with one travel lane in each direction and accommodates approximately 2,000 daily vehicle trips.

## 2. County Street Classifications

The County of Imperial's existing roadway network consists of a highly integrated combination of street types, as follows:

**Prime Arterial** classification generally provides four travel lanes within a 100-foot right-of-way with no parking permitted and a raised median. Its primary purpose is to carry through traffic and provide a direct connection to the State Highway system.

**Major Arterial** classification generally provides four travel lanes within an 84-foot paved width and an 84-foot right-of-way width. The primary function of a major arterial is to carry through traffic and its secondary purpose is to provide access to abutting property.

**Minor Arterial** classification generally provides two travel lanes within a 40-foot paved width and an 84-foot right-of-way width, with provision for a 22-foot wide parkway strip. Its primary purpose is to provide for local traffic movement and access to abutting property, and for movement between local streets and streets of higher classification. Minor arterials provide traffic circulation service within residential, commercial, and industrial areas.





**Collector Road** classification generally provides one lane in each direction with a 40-foot paved width and a 70-foot right-of-way width, allowing for a 15-foot parkway strip and provision for parking and bike lanes. Its primary purpose is to provide for local traffic movement and direct property access. Many Collectors serve industrial and business areas. Table 1 contains the proposed County of Imperial Standard Street Classification which relates levels of service to various roadway classifications.

**Local Road** classification generally provides one lane in each direction with a 40-foot paved width and a 60-foot right-of-way width. Its primary purpose is to provide for local traffic movement and direct property access.

### 3. North/South Arterials

The following County roadways accommodate most of the north/south traffic movement between local cities and communities:

**Drew Road** connects Evan Hewes Highway south to SR-98. Currently, this roadway is a two lane undivided roadway and provides access to I-8 via a diamond-type interchange with stop sign controls at the east and westbound off ramps. Drew Road carries 2,400 and 1,300 ADT north and south of I-8, respectively.

**Forrester Road** provides a connection between Brawley and I-8 west of El Centro and continuing south to McCabe Road. This facility consists of one travel lane in each direction with traffic volumes ranging between 5,300 ADT south of Keystone Road to 6,100 ADT north of Evan Hewes Highway. Forrester Road also provides a diamond-type interchange with I-8 with stop sign controls on both east and westbound off ramps. It should be noted that Forrester Road is planned to be upgraded to a four lane facility and designated as a State Route in the future. This change will require concurrence by the County and Caltrans. Field observations and traffic counts confirm a very high percentage of heavy vehicles traversing this roadway.

**Dogwood Road** connects SR-78 in Brawley to State Route 98 west of the City of Calexico on an alignment which bypasses El Centro on the east. This facility is a two lane undivided roadway with high travel speeds and currently carries between 3,300 and 4,000 ADT.

**Holt Road and Orchard Road** provide primary access to the southcentral portion of Imperial County. This facility provides a diamond-type interchange with Interstate 8 with stop sign controlled intersections for the east and westbound off ramps. This roadway is constructed with one travel lane in each direction. According to the latest available traffic counts, it carries 1,300 ADT between Evan Hewes Highway and Interstate 8. It should be noted that an extension of Orchard road to the south connecting with State Route 98 and ultimately providing service to a new international border crossing is undergoing a limited environmental analysis at this time. More detailed environmental review will be required at such time as Caltrans proposes the extension of SR-7 north of SR-98.





#### 4. East/West Arterials

The following County roadways accommodate most of the east/west traffic movement between local cities and communities:

**Evan Hewes Highway (S80)/Adams Street/SR-115** parallels I-8 to the north and served as the primary travel route between San Diego County and Arizona prior to the construction of I-8. Daily traffic volumes on this facility range from 300 ADT in the Ocotillo vicinity to 9,000 ADT just east of the El Centro city limits. Through the City of El Centro, Evan Hewes Highway connects to Adams Street and is constructed with two travel lanes in each direction. Most portions of this facility are constructed with one travel lane in each direction. West of the City of Holtville, the road corridor becomes SR-115 for approximately one mile and carries 2,100 ADT.

**McCabe Road** is located south of I-8 between Brockman Road (S30) and Orchard Road. Daily traffic volumes on this roadway vary between 500 and 600 ADT.

**Ross Road** connects the communities of Seeley and Holtville traversing through the City of El Centro. East and west of Forrester Road, Ross Road carries 1,300 and 1,200 ADT, respectively. East of the El Centro city limits, this facility carries 3,000 ADT.

**Aten Road** commences west of Forrester Road and terminates at SR-111. It is a two lane undivided roadway and traverses the southernmost portion of the City of Imperial. According to the most recent daily traffic volume counts, Aten Road carries 4,900 and 5,000 ADT east and west of Dogwood Road, respectively.

**Worthington Road** commences north of Seeley and terminates just east of Highline Road north of the City of Holtville. It is a two lane undivided roadway and traverses the northernmost section of the City of Imperial and carries 300 ADT west of Forrester Road. East and west of SR-111, it carries 1,000 and 1,800 ADT, respectively.

**Keystone Road** connects Forrester Road and Highline Road through central Imperial Valley. This two lane undivided roadway carries 1,000 and 800 ADT east and west of SR-86, respectively. Currently, traffic volume data is not available for the eastern segments of this roadway.

**Rutherford Road** provides connection between the City of Westmorland and northcentral Imperial County. East and west of SR-111, it carries 1,100 and 1,400 ADT, respectively.

**County Road S24** is located in the Winterhaven and Bard communities on the far southeastern edge of the County. It follows several roadway alignments (Picacho Road, Ross Road, Collins Road, York Road, and Imperial Dam Road) and traverses in an east/west and north/south manner through the Quechan Indian Reservation. The most recent daily traffic volume information indicates that this roadway carries between 2,000 and 2,800 ADT.



**Winterhaven Drive** between I-8 and Picacho Road serves as the connector between County Route S24 and I-8. The most recent daily traffic volumes on this segment indicate Winterhaven Drive carries 4,700 ADT.

Table 1 presents a summary of selected street segments, their functional classification, most recent daily traffic volumes, and estimated volume to capacity (V/C) ratios and level of service (LOS).

## **5. Public Transportation**

The Countywide Transit System is an inter-city fixed route bus system, subsidized by the Imperial Valley Association of Governments (IVAG), managed by the County Department of Public Works, and operated by a private transportation carrier.

Service is provided daily within the areas classified as the "Primary Corridor" which is a north/south axis throughout Brawley, Imperial, El Centro, and Calexico; and also within the "Secondary Zone" to the outlying communities of Niland, Calipatria, Westmorland, Seeley, and Holtville. The "Remote Zone" communities of Desert Shores, Salton City, Salton Sea Beach, Bombay Beach, and Winterhaven are served once a week throughout the year.

The four routes that include service to Imperial Valley College do not serve the college or the Secondary Zone during college recess or holidays. During the college recess or holidays, Secondary Zone passengers are able to access the once weekly Remote Zone buses, as the buses pass through the respective communities.

## **6. Scenic Highways**

Four areas within the County have the potential as state-designated scenic highways. Senate Bill 1467 established the Scenic Highway Program. SB1467 required a "master plan" of scenic highways. The plan and a list of highways resulted from statewide public hearings in 1963. The following routes have been designated or are eligible for state scenic highway designation:

**Interstate 8.** A portion of I-8 is in the "Master Plan of State Highways Eligible for Official Scenic Highway Designation." The initial segment for future status lies between the San Diego County line and its junction with State Route 98. This segment known as Mountain Springs Grade has a long, rapid elevation change, remarkable rock and boulder scenery and plant life variations.

**State Route 78.** The "Master Plan of State Highways Eligible for Official Scenic Highway Designation" also includes SR-78 from the junction with SR-86 to the San Diego County line. The area is considered scenic because of its desert characteristics and view of Salton Sea.

**State Route 111.** SR-111 travels along the northeast shore of the Salton Sea and is included in the "Master Plan of State Highways Eligible for Official Scenic Highway Designation" from Bombay Beach to the County line. The drive along this body of water is a study in primitive beauty and an interesting and startling anomaly. The contrast between the flat, wide Salton Sea with its sandy beach, and the rugged rise of the Chocolate Mountains has





**TABLE 1**  
**IMPERIAL COUNTY EXISTING VOLUMES AND CONGESTION LEVELS (IN THOUSANDS)**

Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Anza Road						
Pulliam/SR-111	Collector (Local east of Rockwood)	7,100			1.8	A
SR-111/Barbara Worth	Collector	7,100			0.3 <sup>(1)</sup>	A
Aten Road						
SR-86/Clark	Collector	7,100			4.7	C
Clark/Dogwood	Collector (4 lane facility)	7,100			5.0	A
Silsbee/Forrester	Local	7,100	< 1.9 <sup>(2)</sup>			A
Forrester/SR-86 (Imperial)	Collector	7,100			4.7	C
Dogwood/SR-111	Collector (4 lane facility)	7,100			4.9	A
Bennett Road						
Havens/Evan Hewes Hwy	Local	7,100			2.4	B
Evan Hewes Hwy/Ross	Local	7,100	< 1.9 <sup>(2)</sup>			A
Boarts Road (S26)						
SR-86/Kalin	Collector	7,100	< 1.92 <sup>(2)</sup>			A
Borrego Salton Seaway (S22)						
Imperial County Line/SR-86	Minor Arterial	7,100			0.3	A
Brockman Road (S30)						
SR-98/McCabe	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Butters Road (S32)						
Gonder/SR-78	Collector	7,100	< 1.9 <sup>(2)</sup>			A
SR-78/Rutherford	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Rutherford/Bowles	Collector (north to Albright)	7,100	< 1.9 <sup>(2)</sup>			A
Clark Road						
SR-98/Heber	Collector	7,100	1.2			A
Heber/McCabe	Collector	7,100	2.7			B
McCabe/I-8	Local	7,100	3.0	2.9 <sup>(3)</sup>		B
I-8/Ross	Local	7,100			3.5 <sup>(2)</sup>	B
Ross/SR-86	Local	7,100			3.5 <sup>(2)</sup>	B
SR-86/Aten Road	Local (4 lane facility)	7,100			3.9	A
Aten/Worthington	Local	7,100			2.4	B
Worthington/Larsen	Local	7,100	< 1.9 <sup>(2)</sup>			A
Dogwood (S31)						
SR-98/Heber	Collector	7,100	3.6			B
Heber/McCabe	Collector	7,100	3.5			B
McCabe/I-8	Collector	7,100	3.4			B
I-8/Ross	Collector	7,100			3.5 <sup>(2)</sup>	B
Ross/Evan Hewes Hwy	Collector	7,100			3.6 <sup>(2)</sup>	B



**TABLE 1**  
**IMPERIAL COUNTY EXISTING VOLUMES AND CONGESTION LEVELS (IN THOUSANDS)**

Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Evan Hewes Hwy/Aten	Collector	7,100			4.0	B
Aten/Worthington	Collector	7,100			3.7	B
Worthington/Keystone	Collector	7,100			3.3	B
Keystone/SR-78	Collector	7,100			3.6 <sup>(1)</sup>	B
Drew Road (S29)						
SR-98/I-8	Collector	7,100			1.3	A
I-8/Ross	Collector	7,100			1.8	A
Ross/Evan Hewes Hwy	Collector	7,100	2.0		2.4 <sup>(1)</sup>	B
Dunaway Road						
I-8/Evan Hewes Hwy	Collector	7,100	0.1		0.8 <sup>(1)</sup>	A
Eddins Road (S30)						
Gentry/SR-111	Collector	7,100			1.3	A
Evan Hewes Hwy (S80)						
I-8/Imperial Hwy	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Imperial Hwy/W. Limit Plaster City	Collector	7,100			0.3 <sup>(1)</sup>	A
E. Limit Plaster City/Dunaway	Collector	7,100			0.9 <sup>(1)</sup>	A
Dunaway/Drew	Collector	7,100	1.8		2.6 <sup>(1)</sup>	B
Drew/Bennett	Collector (within Seeley)	7,100			3.5 <sup>(2)</sup>	B
Bennett/Forrester	Collector	7,100	4.0		5.4 <sup>(1)</sup>	C
Forrester/SR-86	Collector	7,100			5.3	C
SR-86/Dogwood	Non-County	27,400			9.0 <sup>(2)</sup>	A
Dogwood/SR-111	Collector	27,400			9.0	A
SR-111/SR-115 (W. end)	Collector (4 lane facility)	27,400			7.6	A
SR-115 (E. end)/Gordons Well	Local	7,100	< 1.9 <sup>(2)</sup>			A
Forrester Road (S30)						
McCabe/I-8	Collector	7,100	0.6			A
I-8/Ross	Collector	7,100			6.0 <sup>(1)</sup>	C
Ross/Evan Hewes Hwy	Collector	7,100			5.7 <sup>(1)</sup>	C
Evan Hewes Hwy/Aten	Collector	7,100	4.7		6.1 <sup>(1)</sup>	C
Aten/Worthington	Collector	7,100			5.9 <sup>(1)</sup>	C
Worthington/Keystone	Collector	7,100			5.3 <sup>(1)</sup>	C
Keystone/Cady	Collector	7,100			6.3 <sup>(1)</sup>	C
Cady/Baughman (S. Limit Westmorland)	Collector	7,100			6.0 <sup>(1)</sup>	C
N. Limit Westmorland/Gentry	Collector	7,100			0.9 <sup>(1)</sup>	A
Garst						
Sinclair/McDonald	Collector	7,100	< 1.9 <sup>(2)</sup>			A





**TABLE 1**  
**IMPERIAL COUNTY EXISTING VOLUMES AND CONGESTION LEVELS (IN THOUSANDS)**

Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Gentry Road (S30)						
Forrester/Eddins	Collector	7,100			0.1 <sup>(1)</sup>	A
Eddins/Sinclair	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Heber Road						
La Brucherie/Clark	Local	7,100			0.5 <sup>(1)</sup>	A
Clark/W. end SR-86	Local	7,100			0.8 <sup>(1)</sup>	A
SR-111/Vencill Dr.	Collector	7,100			3.0 <sup>(2)</sup>	B
Highline Road (S33)						
Kavanaugh/Worthington	Collector	7,100	< 0.8 <sup>(1)</sup>			A
Worthington/Keystone	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Keystone/Griffin	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Holt Road (S32)						
N. Limit Holtville/Worthington	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Worthington/Keystone	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Keystone/Gonder	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Hot Mineral Spa Road						
SR-111/Coachella	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Imperial Highway (S2)						
S.D.-Imperial County Line/ Evan Hewes Hwy	Minor Arterial	7,100			0.2	A
Evan Hewes Hwy/I-8	Minor Arterial	7,100	< 1.9 <sup>(2)</sup>			A
I-8/SR-98	Local	7,100			0.2	A
Interstate 8						
S.D.-Imperial County Line/ I-8 & SR-98 Separation	Interstate	N/A <sup>(4)</sup>	8.6	9.1	10.7	A
I-8 & SR-98 Separation/Dunaway	Interstate	N/A <sup>(4)</sup>	7.6	8.5	8.6	A
Dunaway/Drew	Interstate	N/A <sup>(4)</sup>	7.7	8.6	8.7	A
Drew/Forrester	Interstate	N/A <sup>(4)</sup>	8.4	8.4	8.5	A
Forrester/Imperial Ave. (El Centro W. limits)	Interstate	N/A <sup>(4)</sup>	10.5	10.4	10.9	B
Fourth St/El Centro E. limits)/Dogwood	Interstate	N/A <sup>(4)</sup>	21.7	21.6	22.9	B
Dogwood/SR-111	Interstate	N/A <sup>(4)</sup>	20.9	20.8	22.0	B
SR-111/Bowker	Interstate	N/A <sup>(4)</sup>	8.4	8.3	8.4	A
Bowker/Orchard	Interstate	N/A <sup>(4)</sup>	7.7	7.6	7.6	A
Orchard/Bonds Corner Rd.	Interstate	N/A <sup>(4)</sup>	6.7	6.6	6.5	A
Bonds Corner Rd/SR-115	Interstate	N/A <sup>(4)</sup>	6.4	6.3	6.2	A
SR-115/SR-98	Interstate	N/A <sup>(4)</sup>	7.3	7.2	7.2	A
SR-98/Olgilby	Interstate	N/A <sup>(4)</sup>	8.6	8.7	8.7	A
Olgilby/Pilot Knob	Interstate	N/A <sup>(4)</sup>	9.3	9.5	9.6	A
Pilot Knob/SR-186	Interstate	N/A <sup>(4)</sup>	9.9	10.3	10.7	A





**TABLE 1**  
**IMPERIAL COUNTY EXISTING VOLUMES AND CONGESTION LEVELS (IN THOUSANDS)**

Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
SR-186/Winterhaven	Interstate	N/A <sup>(4)</sup>	13.1	13.5	14.0	A
<b>State Route 78</b>						
S.D.-Imperial County Line/Junction SR-86	State Hwy	N/A <sup>(4)</sup>	0.5	0.6	0.6	B
SR-111/SR-115N	State Hwy	N/A <sup>(4)</sup>	4.1	3.6	3.5	B
SR-115N/SR-115S	State Hwy	N/A <sup>(4)</sup>	3.1	4.0	3.1	B
I-115S/Glamis	State Hwy	N/A <sup>(4)</sup>	1.6	1.6	1.6	B
Glamis/Olgilby	State Hwy	N/A <sup>(4)</sup>	1.6	1.4	1.3	B
Olgilby/Palo Verde, Fourth	State Hwy	N/A <sup>(4)</sup>	1.7	1.5	1.5	B
Palo Verde, Fourth/Imperial County Line	State Hwy	N/A <sup>(4)</sup>	2.6	2.6	2.5	B
<b>State Route 86</b>						
Imperial County Line/Desert Shores	State Hwy	N/A <sup>(4)</sup>	7.5	7.3	7.5	A
Desert Shores/Brawley	State Hwy	N/A <sup>(4)</sup>	5.9	5.7	5.8	A
Brawley/S. Marina	State Hwy	N/A <sup>(4)</sup>	4.9	4.8	4.9	B
S. Marina/Air Park	State Hwy	N/A <sup>(4)</sup>	5.4	5.3	5.4	B
Air Park/SR-78 West	State Hwy	N/A <sup>(4)</sup>	4.1	4.0	4.1	B
SR-78 West/Lack	State Hwy	N/A <sup>(4)</sup>	4.3	4.5	4.6	B
Lack/Westmorland W. City Limits	State Hwy	N/A <sup>(4)</sup>	5.0	5.2	5.3	B
Westmorland E. City Limits/Cady	State Hwy	N/A <sup>(4)</sup>	5.0	5.2	5.3	B
Western Ave. (S. Limits Brawley)/Legion	State Hwy	N/A <sup>(4)</sup>	12.8	13.0	13.5	C
Legion/Keystone	State Hwy	N/A <sup>(4)</sup>	10.9	11.1	11.5	C
Keystone/Imperial Ave.	State Hwy	N/A <sup>(4)</sup>	10.5	10.7	11.2	C
I-8/McCabe	State Hwy	N/A <sup>(4)</sup>	8.0	8.8	9.2	C
McCabe/Heber	State Hwy	N/A <sup>(4)</sup>	4.9	5.1	5.1	B
Heber/Dogwood	State Hwy	N/A <sup>(4)</sup>	4.4	5.5	5.5	B
Dogwood/SR-111	State Hwy	N/A <sup>(4)</sup>	4.3	4.4	4.3	B
Imperial S. Limits/El Centro N. Limits	State Hwy	N/A <sup>(4)</sup>			15.5	B
<b>State Route 98</b>						
W. Junction I-8/Imperial Hwy.	State Hwy	N/A <sup>(4)</sup>	1.6	1.8	1.8	A
Imperial Hwy/Drew	State Hwy	N/A <sup>(4)</sup>	1.8	2.1	2.1	A
Drew/Clark	State Hwy	N/A <sup>(4)</sup>	2.5	2.8	2.8	A
Clark/Dogwood	State Hwy	N/A <sup>(4)</sup>	7.8	8.6	8.6	B
Dogwood/Calexico W. City Limits	State Hwy	N/A <sup>(4)</sup>	11.3	12.4	12.0	B
Bowker (just E. of Calexico City Limits)/Barbara Worth	State Hwy	N/A <sup>(4)</sup>	2.6	2.7	2.7	A
Barbara Worth/Bonds Corner	State Hwy	N/A <sup>(4)</sup>	1.5	1.6	1.6	A
Bonds Corner/E. Highline Canal	State Hwy	N/A <sup>(4)</sup>	0.9	0.9	0.9	A
E. Highline Canal/I-8	State Hwy	N/A <sup>(4)</sup>	0.7	0.7	0.7	A
<b>State Route 111</b>						
Cole (Calexico N. Limits)/Heber	State Hwy	N/A <sup>(4)</sup>	22.2	24.0	25.0	B



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Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Heber/McCabe	State Hwy	N/A <sup>(4)</sup>	20.9	20.7	22.0	B
McCabe/I-8	State Hwy	N/A <sup>(4)</sup>	20.1	22.0	23.4	B
I-8/Evan Hewes Hwy	State Hwy	N/A <sup>(4)</sup>	10.7	11.2	12.1	D
Evan Hewes Hwy/Aten	State Hwy	N/A <sup>(4)</sup>	7.7	8.7	9.5	C
Aten/Worthington	State Hwy	N/A <sup>(4)</sup>	7.1	7.2	7.9	B
Worthington/Keystone	State Hwy	N/A <sup>(4)</sup>	7.1	6.6	7.4	B
Keystone/E. Junction 78	State Hwy	N/A <sup>(4)</sup>	4.9	6.2	6.9	B
Shank (Brawley N. Limits)/Rutherford	State Hwy	N/A <sup>(4)</sup>	5.9	6.3	7.1	B
Rutherford/Calipatria S. Limits	State Hwy	N/A <sup>(4)</sup>	6.0	6.2	7.1	B
California St. (just inside Calipatria N. Limits)/Sinclair	State Hwy	N/A <sup>(4)</sup>	6.9	5.3	5.9	B
Sinclair/Niland Ave	State Hwy	N/A <sup>(4)</sup>	7.9	6.6	7.6	B
Niland Ave/English	State Hwy	N/A <sup>(4)</sup>	4.2	5.0	5.6	B
English/Bombay Beach	State Hwy	N/A <sup>(4)</sup>	3.3	3.1	3.1	B
Bombay Beach/Imperial-Riverside County Line	State Hwy	N/A <sup>(4)</sup>	3.4	3.5	3.5	B
State Route 115						
Junction I-8/Grape (Holtville E. Limits)	State Hwy	N/A <sup>(4)</sup>	2.4	2.2	2.1	B
Fourth St (Holtville W. Limits)/ W. Junction Evan Hewes Hwy	State Hwy	N/A <sup>(4)</sup>	5.8	5.7	5.8	B
W. Junction Evan Hewes Hwy/SR-78	State Hwy	N/A <sup>(4)</sup>	2.6	2.5	2.7	B
SR-78/Rutherford	State Hwy	N/A <sup>(4)</sup>	1.2	1.2	1.2	B
Rutherford/Wirt	State Hwy	N/A <sup>(4)</sup>	1.3	1.2	1.3	B
Wirt/East Ave (Calipatria E. Limits)	State Hwy	N/A <sup>(4)</sup>	1.7	1.7	1.8	B
State Route 186						
Mexican Border/I-8	State Hwy	N/A <sup>(4)</sup>	1.9	2.0	2.0	C
Kalin (S26)						
Boarts/Rutherford	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Eddinas/Sainclair	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Keystone Road (S27)						
Forrester/SR-86	Collector	7,100	1.0 <sup>(5)</sup>		0.8 <sup>(1)</sup>	A
SR-86/Dogwood	Collector	7,100			2.0 <sup>(2)</sup>	B
Dogwood/SR-111	Collector	7,100			2.0 <sup>(2)</sup>	B
SR-111/SR-115	Collector	7,100	< 1.9 <sup>(2)</sup>			A
SR-115/Holt	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Holt/Highline	Collector	7,100	< 1.9 <sup>(2)</sup>			A
McCabe Road						
Forrester/Clark	Collector	7,100	0.6 <sup>(5)</sup>		2.0 <sup>(2)</sup>	B
Clark/Heber	Collector	7,100			2.0 <sup>(2)</sup>	B
Heber/Dogwood	Collector	7,100	< 1.9 <sup>(2)</sup>			A





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Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Dogwood/SR-111	Collector	7,100	0.5 <sup>(2)</sup>			A
SR-111/Orchard	Collector	7,100	< 1.9 <sup>(2)</sup>			A
McDonald						
Garst/SR-111	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Miller Road (S33)						
Kumberg/I-8	Collector	7,100	0.4 <sup>(5)</sup>			A
I-8/SR-115	Local	7,100	< 1.9 <sup>(2)</sup>			A
SR-115/Kavanaugh	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Ogilby Road (S34)						
I-8/SR-78	Major Collector	7,100			0.8	A
Orchard Road (S32)						
King/McCabe	Collector	7,100	< 1.9 <sup>(2)</sup>			A
McCabe/I-8	Collector	7,100	< 1.9 <sup>(2)</sup>			A
I-8/SR-115	Collector	7,100			1.3	A
Picacho						
Winterhaven/Ross	Collector	7,100			3.0 <sup>(2)</sup>	B
Ross						
Picacho/Flood	Collector	7,100	2.8			B
Flood						
Ross/Collins	Collector	7,100			2.6 <sup>(2)</sup>	B
Collins						
Flood/York	Collector	7,100			2.4 <sup>(2)</sup>	B
York						
Collins/Mehring	Collector	7,100			2.2 <sup>(2)</sup>	B
Mehring						
York/Imperial Dam	Collector	7,100	2.0			B
Imperial Dam						
Mehring/Imperial County Line	Collector	7,100			2.0 <sup>(2)</sup>	B
Ross Road						
Drew/Bonnett	Local	7,100	< 1.9 <sup>(2)</sup>			A
Bonnett/Forrester	Local	7,100			1.2 <sup>(1)</sup>	A
Forrester/El Centro W. City Limits	Collector	7,100	1.1		1.3 <sup>(1)</sup>	A
Dogwood (El Centro E. City Limits/ SR-111)	Collector	7,100			3.0	B
SR-111/Mets	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Rutherford (S26)						
Kalin/SR-111	Collector	7,100			1.4 <sup>(1)</sup>	A
SR-111/SR-115	Collector	7,100			1.1 <sup>(1)</sup>	A
SR-115/Butters	Collector	7,100	< 1.9 <sup>(2)</sup>			A



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**IMPERIAL COUNTY EXISTING VOLUMES AND CONGESTION LEVELS (IN THOUSANDS)**

Street Segment	Existing Street Classification	LOS C Capacity	Existing Volume (in thousands)			LOS
			1989	1990	1991	
Butters/Irvine	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Winterhaven Drive						
I-8/Picacho	Collector	7,100			4.7	C
Worthington Road (S28)						
Huff/Forrester	Collector	7,100			0.3	A
Forrester/La Brucherie (W. limits of Imperial)	Collector	7,100	0.7			A
Clark (E. limits of Imperial)/Dogwood	Collector	7,100	2.0 <sup>(5)</sup>			B
Dogwood/SR-111	Collector	7,100			1.8	A
SR-111/SR-115	Collector	7,100	1.0 <sup>(5)</sup>			A
SR-115/Holt	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Holt/Highline	Collector	7,100	< 1.9 <sup>(2)</sup>			A
Highline/Highline Canal	Local	7,100	< 1.9 <sup>(2)</sup>			A

<sup>(1)</sup> 1992 Counts

<sup>(2)</sup> Estimated

<sup>(3)</sup> 1986 Counts

<sup>(4)</sup> LOS C capacity not applicable to State Highways and Interstates

<sup>(5)</sup> 1987 Counts



many variations. The panoramic view of the opposite (southwest) shore and its backdrop of mountains is also a sight of pre-historic beauty.

**Borrego-Salton Seaway.** County Highway S-22 is also known as the Borrego-Salton Seaway. It begins in Salton City and ends at the community of Borrego Springs in San Diego County. Along its route is Clay Point, located a mile and a half west of SR-86, which is a formation ring above the flat desert shore which shows the bed of pre-Columbian Lake Cahuilla. Three and a half miles farther west, the Anza Verde Wash parallels the Borrego-Salton Seaway with uniquely scenic desert landforms and vegetation.

To qualify for eligibility as a Scenic Highway there are certain standards for corridor protection which are found in Appendix B of this document. Please refer to the appendices for further details on the applicable standards, policies, possible implementing ordinances, and related issues.

Further, Caltrans has developed an official guide called the "Guidelines for the Official Designation of Scenic Highways" (April 1988) which can be utilized for protecting the County's scenic highways from potential aesthetic impacts from any development projects.

## **7. Railroads**

The Southern Pacific Railroad main line enters the eastern border near Winterhaven and then bears northwest and leaves the County just east of the Salton Sea. This line serves the Los Angeles area and northward in California and the balance of the U.S. eastward. There is a branch line from this main line at Niland that provides rail service to Calipatria, Brawley, Imperial, El Centro, Calexico, and Mexico. Another branch line of the Southern Pacific, the Holton Interurban Railroad, provides service from Holtville to El Centro.

The San Diego and Arizona Eastern Railroad, also a subsidiary of the Southern Pacific railroad, runs between El Centro and San Diego; but, due to damage to the line east of Jacumba in San Diego County, it presently provides rail service only between El Centro and the U.S. Gypsum plant in Plaster City.

All of the above service is freight only. Passenger rail service is being studied to provide service from Calexico to Los Angeles with terminals in Calexico, El Centro, and Brawley. In September 1991, the County Board of Supervisors endorsed the implementation of the County Intercity Railroad Project by Board Resolution.

## **8. Airports**

The primary public use airports in Imperial County are: Imperial County Airport located in the City of Imperial on SR-86; Calexico International Airport located west of Calexico on Anza Road; Brawley Airport located at the intersection of Bemis and Jones Road in northeast Brawley; Calipatria Airport located on West Main Street in Calipatria; Holtville Airport located seven miles northeast of Holtville on Norrish Road; and the U.S. Naval Air Facility located six miles west of El Centro





on Bennett Road. There are several other private airstrips located throughout Imperial County serving principally crop dusting operations.

## **9. Navigable Waterways**

Navigable waters as defined in Section 36 of the Harbors and Navigation Code are waters which come under the jurisdiction of the United States Corps of Engineers and any other publicly-owned waters within the State.

Public recreational waters in Imperial County are: Salton Sea, Ramer Lake, Finney Lake, Wiest Lake, Imperial Lake, Sunbeam Lake, Drew Lake, Senators Wash, and Squaw Lake. Sixty-one miles of the Colorado River from Imperial Dam upriver to the Riverside County line at Taylor's Ferry are also navigable waters, including the backwaters such as Palo Verde Oxbow Lake, Palo Verde Lagoón, Davis Lake, The Old River Channel, Cibola Lake, Three Finger Lake, Draper Lake, Taylor Lake, Ferguson Lake, Clear Lake, Hidden Lake, Bard Lake, and other related backwaters.

## **10. Other Local Public Utilities/Facilities**

About seventy percent of the population is provided potable water for domestic purposes from municipal water districts, which are primarily served by the Imperial Irrigation District (IID). Rural residents obtain potable water from truck delivery companies or from individual wells. IID operates 1700 miles of canals; and the Coachella Irrigation District operates 83 miles of canals that traverse the County. All of the County's cities, and the communities of Seeley, Heber, Niland, Winterhaven, and Salton City, are provided sewer service by municipal districts.

Electricity is provided to the vast majority of Imperial County, and the Coachella Valley portion of Riverside County, by IID. Imperial Irrigation District's generating facilities and sources of power are varied as follows: El Centro, 180 megawatts; Brawley, 18 megawatts; Rockwood, 50 megawatts; and the Coachella Plant, 80 megawatts. An upgrade of the El Centro Power Plant was recently proposed by IID to the California Energy Commission. Hydroelectric facilities along the All American Canal have a maximum capacity of 45 megawatts.

Due to the County's seismic conditions, the Pacific Bell telephone system is one of the most elaborate communication networks in the country. The equipment and facilities in Imperial County are earthquake resistant up to an 8.0 magnitude.

## **11. Petroleum and Natural Gas Lines**

Liquid petroleum products are delivered to and are transported through the County via the twenty-inch Santa Fe Pacific Pipe Line. This line is generally located within the Southern Pacific Railroad right-of-way. The right-of-way follows the northwest to southeast trend of Imperial Valley. It passes near the east side of the Salton Sea and serves the storage facility at Niland. The petroleum storage capacity at Niland is 77,500 barrels and at Imperial is 289,000 barrels. Storage tanks, however, are never full at one time but are normally filled fifty percent. Southeast of Ogilby, the



line turns east and travels to Yuma. A six-inch branch line distributes gas to the storage facility south of Imperial and a four-inch line serves the Naval Air Facility near Seeley.

Natural gas is delivered by the Southern California Gas Company via twin ten-inch lines which generally run south through the County in Range 14 East. These lines serve Niland, Calipatria, Brawley, Imperial, El Centro, Heber, and Calexico; and branch lines serve Holtville, Westmorland, Seeley, NAF, and Plaster City. Rural residents are served by laterals from the branch lines. The lateral lines typically do not exceed a quarter mile in length.

### C. Trends

In order to plan the ultimate circulation system for the County of Imperial, it is critical to account for existing as well as future development patterns. The methodology utilized to forecast traffic volumes on future roadways within Imperial County consisted of a variety of commonly used tools. These include trend line analysis, future population projections, projections contained in Caltrans District 11 Route Concept Reports (RCRs), and manual assignment of approved projects and land use decisions made by the County Board of Supervisors. Circulation Elements from the incorporated cities were also examined to ensure consistency on a county-wide basis.

Table 2 contains major street segments within the County, existing daily traffic volumes, growth rates estimated for those segment, year 2015 projected daily traffic volumes, and associated levels of service per functional classification. It should be noted that LOS criteria for interstate routes and state highways were extracted from the previously mentioned RCRs prepared by Caltrans and do not reflect proposed County of Imperial LOS standards.

As shown on Table 2, all unincorporated area street segments are forecast to operate at LOS C or better on a daily basis. For the purpose of this analysis, LOS C will be targeted as the minimum acceptable level of service. Most roadway segments are forecast to operate at LOS A with their proposed Circulation Element classification. Level of service on State Highways, in some cases, deteriorates to LOS D, however the County of Imperial has no jurisdiction over State Highways and planning for these facilities is undertaken by the State of California. County roads that do intersect with State routes should be given special consideration due to the fact that delays at intersections tend to deteriorate operating conditions along street segments.

For purposes of analysis, a table to compare daily traffic levels of service has been utilized. This is a broad base approach which can be used to identify potential capacity constraints. Where this potential exists, a more detailed peak hour analysis should be performed. The table which was developed as part of this study differs from the "daily capacities" used in the County of Imperial for traffic impact analysis studies. These "capacities" were generalized and not documented by any quantitative method. Of course, each jurisdiction determines what is an acceptable level of service, the table merely provides better uniformity in measuring the level of service.





**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
Anza Road						
Pulliam/SR-111	10.2	1991	3%	17.5	Major Arterial	B
Dogwood/SR-111	5.1 <sup>(1)</sup>	1991	3%	8.8	Secondary Arterial	A
SR-111/Barbara Worth	.3	1992	3%	0.5	Collector	A
Aten Road						
SR-86/Clark	4.7	1991	3%	8.1	Secondary Arterial	A
Clark/Dogwood	5.0	1991	3%	8.6	Secondary Arterial	A
Silsbee/Forrester	4.0 <sup>(1)</sup>	1991	2%	5.9 <sup>(1)</sup>	Secondary Arterial	A
Forrester/SR-86 (Imperial)	4.7	1991	2%	7.0	Secondary Arterial	A
Dogwood/SR-111	4.9	1991	2%	8.4	Secondary Arterial	A
Bennett Road						
Havens/Evan Hewes Hwy	2.4	1991	3%	4.1	Collector	C
Evan Hewes Hwy/Ross	2.4 <sup>(1)</sup>	1991	2%	3.6 <sup>(1)</sup>	Collector	B
Boarts Road (S26)						
SR-86/Kalin	1.4 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	2.0	Collector	B
Borrego Salton Seaway (S22)						
Imperial County Line/SR-86	0.3	1992	2%	0.4	Collector	A
Brockman Road (S30)						
SR-98/McCabe	0.7 <sup>(1)</sup>	1989	5% <sup>(1)</sup>	1.6	Collector	A
Butters Road						
Gonder/SR-78	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2	Collector	A
SR-78/Rutherford	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2	Collector	A
Rutherford/Bowles	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2	Collector	A
Clark Road						
SR-98/Heber	2.2	1992	3%	3.7	Secondary	A
Heber/McCabe	2.3	1992	2%	3.4	Secondary	A
McCabe/I-8	3.0	1989	1.1%	3.9	Secondary	A
I-8/Ross	3.5 <sup>(1)</sup>	1991	2%	5.2 <sup>(1)</sup>	Secondary	A
Ross/SR-86	3.5 <sup>(1)</sup>	1991	2%	5.2 <sup>(1)</sup>	Secondary	A
SR-86/Aten Road	3.9 <sup>(1)</sup>	1991	2%	5.8 <sup>(1)</sup>	Secondary	A
Aten/Worthington	2.4 <sup>(1)</sup>	1991	3% <sup>(1)</sup>	4.1	Secondary	A
Worthington/Larsen	2.4 <sup>(1)</sup>	1991	3% <sup>(1)</sup>	4.1 <sup>(1)</sup>	Secondary	A
Dogwood (S31)						
Anza/SR-98	N/A	N/A	5%	4.0 <sup>(2)</sup>	Secondary Arterial	A
SR-98/Heber	3.6	1989	5% <sup>(1)</sup>	8.3	Secondary Arterial	A
Heber/McCabe	3.5	1989	5% <sup>(1)</sup>	8.1	Secondary Arterial	A
McCabe/I-8	3.4	1989	5% <sup>(1)</sup>	7.8	Secondary Arterial	A
I-8/Ross	3.5 <sup>(1)</sup>	1991	5% <sup>(1)</sup>	7.7	Secondary Arterial	A
Ross/Evan Hewes Hwy	3.6 <sup>(1)</sup>	1991	5% <sup>(1)</sup>	7.9	Secondary Arterial	A
Evan Hewes Hwy/Aten	4.0	1991	5% <sup>(1)</sup>	8.8	Secondary Arterial	A
Aten/Worthington	3.7	1991	5% <sup>(1)</sup>	8.1	Secondary Arterial	A
Worthington/Keystone	3.3	1991	5% <sup>(1)</sup>	7.3	Secondary Arterial	A



**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
Keystone/SR-78	3.6	1992	5% <sup>(1)</sup>	7.7	Secondary Arterial	A
<b>Drew Road (S29)</b>						
SR-98/I-8	1.3	1991	3% <sup>(1)</sup>	2.2	Collector	B
I-8/Ross	1.8	1991	15% <sup>(1)</sup>	8.0	Secondary	A
Ross/Evan Hewes Hwy	2.4	1992	15%	10.7	Secondary	A
<b>Dunaway Road</b>						
I-8/Evan Hewes Hwy	0.8	1992	20%	4.5	Collector	C
<b>Eddins Road (S30)</b>						
Gentry/SR-111	1.3	1991	2% <sup>(1)</sup>	1.9	Collector	A
<b>Evan Hewes Hwy (S80)</b>						
I-8/Imperial Hwy	0.3 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.4	Collector	A
Imperial Hwy/W. Limit Plaster City	0.3	1992	2% <sup>(1)</sup>	0.4	Collector	A
E. Limit Plaster City/Dunaway	0.9	1992	2% <sup>(1)</sup>	1.3	Collector	A
Dunaway/Drew	2.6	1992	14.8%	11.5	Secondary Arterial	A
Drew/Bennett	3.5 <sup>(1)</sup>	1992	13% <sup>(1)</sup>	14.0 <sup>(1)</sup>	Secondary Arterial	B
Bennett/Forrester	5.4	1992	11.7%	19.0	Secondary Arterial	B
Forrester/SR-86	5.3	1991	8.9%	16.6	Secondary Arterial	B
SR-86/Dogwood	9.0	1991	4% <sup>(1)</sup>	17.6	Non-County	B
Dogwood/SR-111	9.0	1991	4% <sup>(1)</sup>	17.6	Secondary Arterial	B
SR-111/SR-115 (W. end)	7.6	1991	3% <sup>(1)</sup>	13.1	Secondary Arterial	A
SR-115 (E. end)/Gordons Well	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
<b>Forrester Road (S30)</b>						
McCabe/I-8	0.6	1989	2% <sup>(1)</sup>	0.9	Collector	A
I-8/Ross	6.0	1992	5% <sup>(1)</sup>	12.9	Major Arterial	A
Ross/Evan Hewes Hwy	5.7	1992	5% <sup>(1)</sup>	12.3	Major Arterial	A
Evan Hewes Hwy/Aten	6.1	1992	9.9%	20.0	Major Arterial	B
Aten/Worthington	5.9	1992	5% <sup>(1)</sup>	12.7	Major Arterial	A
Worthington/Keystone	5.3	1992	5% <sup>(1)</sup>	11.4	Major Arterial	A
Keystone/Cady	6.3	1992	5% <sup>(1)</sup>	13.5	Major Arterial	A
Cady/Baughman (S. Limit Westmorland)	6.0	1992	5% <sup>(1)</sup>	12.9	Major Arterial	A
N. Limit Westmorland/Gentry	0.9	1992	2% <sup>(1)</sup>	1.3	Collector	A
Sinclair/McDonald	0.2 <sup>(1)</sup>	1992	2%	0.3 <sup>(1)</sup>	Collector	A
<b>Gentry Road (S30)</b>						
Forrester/Eddins	0.1	1992	2% <sup>(1)</sup>	0.1	Collector	A
Eddins/Sinclair	1.0 <sup>(1)</sup>	1992	2%	1.5	Collector	A
<b>Heber Road</b>						
La Brucherie/Clark	0.5 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.7 <sup>(1)</sup>	Collector	A
Clark/W. end SR-86	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A
SR-111/Vencill Dr.	3.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	4.4 <sup>(1)</sup>	Collector	C
<b>Highline Road (S33)</b>						
Kavanaugh/Worthington	0.4 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.6 <sup>(1)</sup>	Collector	A
Worthington/Keystone	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A





**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
Keystone/Griffin	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A
<b>Holt Road (S32)</b>						
N. Limit Holtville/Worthington	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
Worthington/Keystone	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
Keystone/Gonder	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
<b>Hot Mineral Spa Road</b>						
SR-111/Coachella	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
<b>Imperial Highway (S2)</b>						
S.D.-Imperial County Line/Evan Hewes Hwy	0.2	1991	2% <sup>(1)</sup>	0.3	Secondary Arterial	A
Evan Hewes Hwy/I-8	0.2 <sup>(1)</sup>	1991	2% <sup>(1)</sup>	0.3 <sup>(1)</sup>	Secondary Arterial	A
I-8/SR-98	0.2	1991	2% <sup>(1)</sup>	0.3 <sup>(1)</sup>	Collector	A
<b>Interstate 8</b>						
S.D.-Imperial County Line/I-8 & SR-98 Separation	10.7	1991	6.0%	26.1	State Hwy	B
I-8 & SR-98 Separation/Dunaway	8.6	1991	4.7%	18.3	State Hwy	B
Dunaway/Drew	8.7	1991	5.3%	19.8	State Hwy	B
Drew/Forrester	8.5	1991	4.3%	17.3	State Hwy	B
Forrester/Imperial Ave. (El Centro W. limits)	10.9	1991	7.0% <sup>(1)</sup>	29.2	State Hwy	B
Fourth St/El Centro E. limits)/Dogwood	22.9	1991	5.0% <sup>(1)</sup>	50.4	State Hwy	D
Dogwood/SR-111	22.0	1991	5.0% <sup>(1)</sup>	48.4	State Hwy	D
SR-111/Bowker	8.4	1991	3.7%	15.9	State Hwy	A
Bowker/Orchard	7.6	1991	3.4%	13.8	State Hwy	A
Orchard/Bonds Corner Rd.	6.5	1991	4.0% <sup>(1)</sup>	12.7	State Hwy	A
Bonds Corner Rd/SR-115	6.2	1991	4.0% <sup>(1)</sup>	12.2	State Hwy	A
SR-115/SR-98	7.2	1991	4.0% <sup>(1)</sup>	14.1	State Hwy	A
SR-98/Olgilby	8.7	1991	2.5%	13.9	State Hwy	A
Olgilby/Pilot Knob	9.6	1991	3.1%	16.7	State Hwy	B
Pilot Knob/SR-186	10.7	1991	4.2%	21.5	State Hwy	B
SR-186/Winterhaven	14.0	1991	7.0%	37.5	State Hwy	C
<b>State Route 78</b>						
S.D.-Imperial County Line/Junction SR-86	0.6	1991	7.0% <sup>(1)</sup>	1.6	State Hwy	B
SR-111/SR-115N	3.5	1991	3.0% <sup>(1)</sup>	6.0	State Hwy	C
SR-115N/SR-115S	3.1	1991	4.0% <sup>(1)</sup>	6.1	State Hwy	C
1-115S/Glamis	1.6	1991	2.0% <sup>(1)</sup>	2.4	State Hwy	B
Glamis/Olgilby	1.3	1991	3.7%	2.5	State Hwy	B
Olgilby/Palo Verde, Fourth	1.5	1991	4.2%	3.0	State Hwy	B
Palo Verde, Fourth/Imperial County Line	2.5	1991	7.7%	7.1	State Hwy	C
<b>State Route 86</b>						
Imperial County Line/Desert Shores	7.5	1991	9.0%	23.7	State Hwy	B
Desert Shores/Brawley	5.8	1991	6.8%	15.3	State Hwy	B
Brawley/S. Marina	4.9	1991	4.4%	10.1	State Hwy	B
S. Marina/Air Park	5.4	1991	7.2%	14.7	State Hwy	B





**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
Air Park/SR-78 West	4.1	1991	5.9%	9.9	State Hwy	B
SR-78 West/Lack	4.6	1991	11.8%	17.6	State Hwy	B
Lack/Westmorland W. City Limits	5.3	1991	0.7%	6.2	State Hwy	B
Westmorland E. City Limits/Cady	5.3	1991	1.9%	7.7	State Hwy	A
Western Ave. (S. Limits Brawley)/Legion	13.5	1991	2.0%	20.0	State Hwy	B
Legion/Keystone	11.5	1991	3.8% <sup>(1)</sup>	22.0	State Hwy	C
Keystone/Imperial Ave.	11.2	1991	4.0%	22.0	State Hwy	C
Imperial S. Limits/El Centro N. Limits	15.5	1991	3.0% <sup>(1)</sup>	26.7	State Hwy	C
I-8/McCabe	9.2	1991	8.0%	26.9	State Hwy	C
McCabe/Heber	5.1	1991	3.8%	9.8	State Hwy	C
Heber/Dogwood	5.5	1991	4.8%	11.8	State Hwy	D
Dogwood/SR-111	4.3	1991	1.6%	6.0	State Hwy	C
<b>State Route 98</b>						
W. Junction I-8/Imperial Hwy.	1.8	1991	10.0% <sup>(1)</sup>	6.1	State Hwy	B
Imperial Hwy/Drew	2.1	1991	10.0% <sup>(1)</sup>	7.1	State Hwy	B
Drew/Clark	2.8	1991	3.3%	5.0	State Hwy	B
Clark/Dogwood	8.6	1991	4.0%	16.9	State Hwy	C
Dogwood/Calexico W. City Limits	12.0	1991	5.0% <sup>(1)</sup>	26.1	State Hwy	C
Bowker (just E. of Calexico City Limits)/Barbara Worth	2.7	1991	33.0% <sup>(1)</sup>	24.1	State Hwy	C
Barbara Worth/Bonds Corner	1.6	1991	12.5% <sup>(1)</sup>	6.4 <sup>(1)</sup>	State Hwy	B
Bonds Corner/E. Highline Canal	0.9	1991	0.9%	1.1	State Hwy	A
E. Highline Canal/I-8	0.7	1991	3.3%	1.3	State Hwy	A
<b>State Route 111</b>						
Cole (Calexico N. Limits)/Heber	25.0	1991	3.0% <sup>(1)</sup>	43.0	State Hwy	C
Heber/McCabe	22.0	1991	3.0% <sup>(1)</sup>	37.8	State Hwy	C
McCabe/I-8	23.4	1991	3.0% <sup>(1)</sup>	40.2	State Hwy	C
I-8/Evan Hewes Hwy	12.1	1991	3.0% <sup>(1)</sup>	20.8	State Hwy	B
Evan Hewes Hwy/Aten	9.5	1991	3.0% <sup>(1)</sup>	16.3	State Hwy	B
Aten/Worthington	7.9	1991	3.0% <sup>(1)</sup>	13.6	State Hwy	B
Worthington/Keystone	7.4	1991	3.0% <sup>(1)</sup>	12.7	State Hwy	B
Keystone/E. Junction 78	6.9	1991	3.0% <sup>(1)</sup>	11.9	State Hwy	B
Shank (Brawley N. Limits)/Rutherford	7.1	1991	5.4%	16.3	State Hwy	B
Rutherford/Calipatria S. Limits	7.1	1991	5.8%	17.0	State Hwy	B
California St (just inside Calipatria N. Limits)/Sinclair	5.9	1991	2.4%	9.3	State Hwy	B
Sinclair/Niland Ave	7.6	1991	6.9	20.2	State Hwy	C
Niland Ave/English	5.6	1991	6.5%	14.3	State Hwy	B
English/Bombay Beach	3.1	1991	4.5% <sup>(1)</sup>	6.4	State Hwy	B
Bombay Beach/Imperial-Riverside County Line	3.5	1991	3.8%	6.7	State Hwy	B
<b>State Route 115</b>						
Junction I-8/Grape (Holtville E. Limits)	2.1	1991	2.8% <sup>(1)</sup>	3.5	State Hwy	B



**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
Fourth St (Holtville W. Limits)/W. Junction Evan Hewes Hwy	5.8	1991	1.1%	7.3	State Hwy	C
W. Junction Evan Hewes Hwy/SR-78	2.7	1991	1.5%	3.7	State Hwy	B
SR-78/Rutherford	1.2	1991	7.5%	3.4	State Hwy	B
Rutherford/Wirt	1.3	1991	6.8%	3.4	State Hwy	B
Wirt/East Ave (Calipatria E. Limits)	1.8	1991	4.0%	3.5	State Hwy	B
<b>State Route 186</b>						
Mexican Border/I-8	2.0	1991	5.0%	4.4	State Hwy	C
<b>Kalin (S26)</b>						
Boarts/Rutherford	1.4 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	2.0 <sup>(1)</sup>	Collector	B
Eddins/Sinclair	0.3 <sup>(1)</sup>	1992	2%	0.4 <sup>(1)</sup>	Collector	A
<b>Keystone Road (S27)</b>						
Forrester/SR-86	0.8	1992	2% <sup>(1)</sup>	1.2	Collector	A
SR-86/Dogwood	2.0 <sup>(1)</sup>	1992	14% <sup>(1)</sup>	8.4 <sup>(1)</sup>	Secondary	A
Dogwood/SR-111	2.0 <sup>(1)</sup>	1992	14% <sup>(1)</sup>	8.4 <sup>(1)</sup>	Secondary	A
SR-111/SR-115	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
SR-115/Holt	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
Holt/Highline	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A
<b>McCabe Road</b>						
Forrester/Clark	2.0	1992	2% <sup>(1)</sup>	2.9	Collector	B
Clark/Heber	2.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	2.9 <sup>(1)</sup>	Collector	B
Heber/Dogwood	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
Dogwood/SR-111	0.5	1987	2% <sup>(1)</sup>	0.8	Collector	A
SR-111/Orchard	0.5 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.70 <sup>(1)</sup>	Collector	A
<b>Miller Road (S33)</b>						
Kumberg/I-8	0.4	1987	2% <sup>(1)</sup>	0.6	Collector	A
I-8/SR-115	0.5 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.7 <sup>(1)</sup>	Collector	A
SR-115/Kavanaugh	0.6 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.9 <sup>(1)</sup>	Collector	A
<b>Ogilby Road (S34)</b>						
I-8/SR-78	0.8	1991	2% <sup>(1)</sup>	1.2	Collector	A
<b>Orchard Road (S32)</b>						
King/McCabe	0.5 <sup>(1)</sup>	1992	N/A <sup>(2)</sup>	30.0 <sup>(1)</sup>	Prime	B
McCabe/I-8	1.0 <sup>(1)</sup>	1992	N/A <sup>(2)</sup>	35.0 <sup>(1)</sup>	Prime	B
I-8/SR-115	1.3	1990	N/A <sup>(2)</sup>	15.0 <sup>(1)</sup>	Major	B
<b>Picacho (S24)</b>						
Winterhaven/Ross	3.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	4.4 <sup>(1)</sup>	Collector	C
<b>Ross</b>						
Picacho/Flood	2.8	1989	2% <sup>(1)</sup>	4.3	Collector	C
<b>Flood</b>						
Ross/Collins	2.6 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	3.8 <sup>(1)</sup>	Collector	B
<b>Collins</b>						
Flood/York	2.4 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	3.5 <sup>(1)</sup>	Collector	B





**TABLE 2**  
**IMPERIAL COUNTY YEAR 2015 PROJECTED VOLUMES (IN THOUSANDS)**

Street Segment	Existing Volume		Growth Rate	Year 2015	Proposed Classification	LOS
	Volume	Year				
York						
Collins/Mehring	2.2 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	3.2 <sup>(1)</sup>	Collector	B
Mehring						
York/Imperial Dam	2.0	1989	2% <sup>(1)</sup>	3.0	Collector	B
Imperial Dam						
Mehring/Imperial County Line	2.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	2.9 <sup>(1)</sup>	Collector	B
Ross Road						
Drew/Bonnett	1.2 <sup>(1)</sup>	1992	6% <sup>(1)</sup>	2.9 <sup>(1)</sup>	Collector	B
Bennett/Forrester	1.2	1992	6% <sup>(1)</sup>	2.9	Collector	B
Forrester/El Centro W. City Limits	1.3	1992	6.1%	3.1	Collector	B
Dogwood (El Centro E. City Limits/SR-111	3.0	1991	3% <sup>(1)</sup>	5.2	Collector	C
SR-111/Mets	1.2 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.8 <sup>(1)</sup>	Collector	A
Rutherford (S26)						
Kalin/SR-111	1.4	1992	2% <sup>(1)</sup>	2.0	Collector	B
SR-111/SR-115	1.1	1992	2% <sup>(1)</sup>	1.6	Collector	A
SR-115/Butters	1.0 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.5 <sup>(1)</sup>	Collector	A
Butters/Irvine	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A
Sinclair						
Kalin/Sr-111	0.3 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.4 <sup>(1)</sup>	Collector	A
Walker						
Forrester/Gentry	0.9 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.3 <sup>(1)</sup>	Collector	A
Winterhaven Drive						
I-8/Picacho	4.7	1991	2% <sup>(1)</sup>	7.0	Secondary	A
Worthington Road (S28)						
Huff/Forrester	0.3	1991	2% <sup>(1)</sup>	0.4	Collector	A
Forrester/La Brucherie (W. limits of Imperial)	0.7	1989	2% <sup>(1)</sup>	1.1	Collector	A
Clark (E. limits of Imperial)/Dogwood	2.0	1987	3% <sup>(1)</sup>	3.7	Collector	B
Dogwood/SR-111	1.8	1991	3% <sup>(1)</sup>	3.1	Collector	B
SR-111/SR-115	1.0	1987	2% <sup>(1)</sup>	1.6	Collector	A
SR-115/Holt	0.8 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	1.2 <sup>(1)</sup>	Collector	A
Holt/Highline	0.6 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.9 <sup>(1)</sup>	Collector	A
Highline/Highline Canal	0.6 <sup>(1)</sup>	1992	2% <sup>(1)</sup>	0.9 <sup>(1)</sup>	Collector	A

<sup>(1)</sup> Estimated

<sup>(2)</sup> LOS C capacity not applicable to State Highways and Interstates



### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The following presents a set of goals and objectives of the Circulation and Scenic Highways Element along with policies to achieve these specific goals and objectives. They have been prepared in collaboration with the General Plan Ad-Hoc Advisory Committee appointed by the Board of Supervisors.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for land use decision making. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Safe, Convenient, and Efficient Transportation System**

Goal 1: The County will provide an integrated transportation system for the safe and efficient movement of people and goods within and through the County of Imperial with minimum disruption to the environment.

Objective 1.1 Maintain and improve the existing road and highway network, while providing for future expansion and improvement based on travel demand and the development of alternative travel modes.

Objective 1.2 Require a traffic analysis for any new development which may have a significant impact on County roads. In general, a traffic analysis should be required for projects which generate more than 500 ADT.

Objective 1.3 Ensure safe and coordinated traffic patterns, contiguous growth, and promote a planned and consistent development around city/township areas.

Objective 1.4 In addition to Collector and Arterial roads, maintain and, where appropriate, extend the existing network of Local Streets which have been historically plotted along section and half-section lines, and which provide alternative local routes to connect with Collector and Arterial streets.

Objective 1.5 Encourage the balance of employment, services, and housing throughout the County to preclude future traffic congestion.





Objective 1.6 Expand and improve needed public utilities relating to transportation.

Objective 1.7 Finance, or seek funding for circulation system maintenance projects.

Objective 1.8 The County's circulation system shall promote efficient intra- and inter-County travel with minimum disruption to established and planned communities.

Objective 1.9 Identify busy agricultural roads to create special crossings for farm equipment.

Objective 1.10 Maintain and expand public transit services to keep pace with population and job growth.

### **Multiple Modes of Transportation**

Goal 2: Consider all modes of transportation including motor vehicle, mass transit, air transportation, and non-motorized transportation.

Objective 2.1 Develop a balanced circulation system which will provide for the economical, efficient, and safe movement of people and goods within and through the County.

Objective 2.2 Encourage a mix of transportation modes to meet community needs.

Objective 2.3 Develop and improve aviation facilities.

Objective 2.4 Reduce aviation-related hazards, including hazards to aircraft and hazards posed by aircraft.

Objective 2.5 Ensure consistency of the General Plan with the provisions of the Airport Land Use Plan.

### **Alternate Modes of Transport**

Goal 3: Develop alternative transportation strategies designed to reduce traffic volumes and improve traffic flow.

Objective 3.1 Develop and improve transit and paratransit services and programs.

Objective 3.2 Encourage the improvement and expansion of needed railroads and bus routes in the County transportation system.

Objective 3.3 Develop and improve bicycle routes and pedestrian walkways. Consider the needs of bicyclists in the design, construction, and maintenance of all County roads, with specific attention to those roads established and defined in a network of key bicycling routes.

Objective 3.4 Ensure the safety of the traveling public, including pedestrians and bicyclists.





Objective 3.5 Attempt to reduce motor vehicle air pollution.

### **Scenic Highways**

Goal 4: The County shall make every effort to develop a circulation system that highlights and preserves the environmental and scenic amenities of the area.

Objective 4.1 Establish various systems of scenic recreational travel utilizing multiple transportation modes.

Objective 4.2 Preserve, enhance, and protect Imperial County's scenic resources by the removal of illicit billboards from scenic areas and restrictions on new off-site sign construction visible from designated scenic highways.

Objective 4.3 Protect areas of outstanding scenic beauty along any scenic highways and protect the aesthetics of those areas.

Objective 4.4 Acquire scenic easements from private owners when required.

Objective 4.5 Develop standards for aesthetically valuable sites. Design review may be required so that structures, facilities, and activities are properly merged with the environment.

### **Regional Transportation System**

Goal 5: Participate in and assist with coordinating regional efforts which integrate the County Transportation System with the Regional Transportation System.

Objective 5.1 The County's Circulation Element shall be designed to provide the facility and level of access necessary to serve the specific existing and proposed land uses designated in the Land Use Plan and to satisfy regional travel needs.

Objective 5.2 The County shall provide necessary facilities to obtain balanced use of all travel modes to address the transportation needs of all ages and to provide mobility for a variety of trip purposes. The County shall generally recognize the following priorities for new transportation facilities: vehicular, freight movement, transit, pedestrian, and bicycle.

Objective 5.3 The County shall cooperate with the adjacent communities and agencies such as the Federal Government, State Department of Transportation (Caltrans District 11), El Centro, Brawley, Calexico, Holtville, Imperial, Westmorland, and Calipatria to provide the maximum compatibility of adopted circulation elements and regional facility plans.

Objective 5.4 The County shall coordinate regularly with Caltrans to obtain information on trends and plans for roadway changes and improvements which would affect the noise environment.



### C. Relationship to Other General Plan Elements

The Circulation and Scenic Highways Element Policy Matrix (Table 3) identifies the relationship between the Circulation and Scenic Highways Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

<b>TABLE 3</b> <b>CIRCULATION AND SCENIC HIGHWAYS ELEMENT POLICY MATRIX</b>								
Issue Area	Land Use	Housing	Noise	Seismic/ Public Safety	Agricultural	Open Space Conservation	Geothermal	Water
Safe/Efficient System	X	X		X				
Scenic Highways	X					X		
Regional Transport	X		X					





#### IV. IMPLEMENTATION PROGRAMS AND POLICIES

##### A. Preface

Any plan is only as good as the means of carrying it out. There are various tools and methods to insure that the intent of the Circulation and Scenic Highways Element is followed. These programs are described below.

##### B. Programs and Policies

##### 1. Circulation and Scenic Highways Plan

The goal of the Circulation and Scenic Highways Plan (see Figure 1) is to provide a network of roadways throughout the County, which is the foundation of the transportation system. The street system is used for vehicular, bicycle, transit, pedestrian, and freight movement. Thus, it is essential to define a hierarchical system in which each roadway functions in a manner consistent with its intended use.

##### a. Roadway Classifications

The policies contained in this section are intended to encourage design standards which promote efficiency and safety of the circulation system. The Circulation Element street classifications are Prime Arterial, Major Arterial, Secondary Arterial, Collector Street, and Local Street as described in Chapter I. A large scale map of these proposed routes is available at the County Planning Department and Department of Public Works. Table 4 presents a summary of the estimated level of service for each classification, as well as for residential streets, cul de sacs, and loop streets.

<b>TABLE 4</b> <b>IMPERIAL COUNTY STANDARD STREET CLASSIFICATION</b> <b>AVERAGE DAILY VEHICLE TRIPS</b>						
Road		Level of Service				
Class	X-Section	A	B	C	D	E
Prime Arterial	106/126	22,200	37,000	44,600	50,000	57,000
Major Arterial	82/102	14,800	24,700	29,600	33,400	37,000
Secondary Arterial	64/84	13,700	22,800	27,400	30,800	34,200
Collector Street	40/70	1,900	4,100	7,100	10,900	16,200
Local Street	40/60	*	*	4,500	*	*
Residential Street	40/60	*	*	1,500	*	*
Residential Cul-de-Sac or Loop Street	40/60	*	*	200	*	*
* Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.						



Table 4 was originally developed for the County of San Diego by the San Diego County Department of Public Works in 1985 and compares ADT to levels of service (LOS) for various roadway classifications. Proposed functional classifications were then inserted into this table and right-of-way widths adjusted to match County of Imperial standards.

**b. Transition Areas**

The Circulation and Scenic Highways Plan is the graphical reference guide which shows the present and planned street system, along with the classification of those streets. It is important to note that where there is a change from one classification to another along a certain street, the transition will occur in mid-block areas to preclude non-continuing lanes and intersections. The design criteria (design, speed, curve radii, etc.) for the higher classification shall generally take precedence through the transition area. The County Director of Public Works shall review these transition areas and provide guidance in achieving this policy.

**c. New Local Roads**

The County shall require new development to provide for local roads to serve the direct access needs of abutting property. These streets should be designed with a discontinuous pattern to discourage through traffic. They generally should not intersect with arterial street classifications. Typical design features include two travel lanes with parking on both sides of the street. Local roads include loop streets and cul-de-sacs.

**d. Level of Service Standards**

The County's goal for an acceptable traffic service standard during AM and PM peak periods shall be LOS C for all arterial and street links and LOS C for all intersections. These service values are defined by the 1985 edition of the *Highway Capacity Manual* or any subsequent edition thereof. This policy shall acknowledge that the aforementioned level of service standards may not be obtainable on some existing facilities where abutting development precludes acquisition of additional right-of-way needed for changes in facility classification.

In order to achieve the level of service goals in the previous policy, the County shall develop and institute a long-range funding program in which new land development shall bear the major burden of the associated costs and improvement requirements.

**e. Design Standards**

The County shall adopt design standards for all streets in accordance with their functional classifications and recognized design guidelines. In developing these standards, the County shall consider the design standards of Caltrans and the American Association of State and Highway Transportation Officials (AASHTO). All streets within the County shall be designed in accordance with the adopted County of Imperial Design Standards. Typical cross sections and design criteria for the various street classifications are shown as an attachment to this document.





**f. Private Streets**

The County may permit construction of private streets within individual development projects providing:

- They are designed geometrically and structurally to meet County standards;
- Only project occupants are served;
- Emergency vehicle access requirements are satisfied;
- The streets do not provide a direct through route between public streets;
- The Homeowners Associations and/or property owners provide an acceptable program for financing regular street maintenance.

**g. Street Access Guidelines**

The County shall institute street access guidelines consistent with the street classifications. These shall be applied where feasible to all new developments. The following guidelines shall be used to define appropriate access:

- The County shall prohibit driveway access to Prime Arterials.
- Access to Major Arterials shall not be permitted unless there is no other reasonable means of access to the public street system. Where access to Major or Secondary Arterials must be allowed, it shall be limited through the use of medians and/or access controls in order to maintain street capacity.
- Along Major Arterials, access spacing shall be a standard distance of 1,200 feet or more. Under special circumstances, this distance may be reduced to a minimum of 600 feet. Along secondary arterials, the corresponding access spacing shall be 600 feet for the standard distance and 300 feet for the minimum distance. The above measurements shall be from the ends of the curb returns.

**h. Specific Alignment Plans**

The County shall adopt specific alignment plans when "stand equal sided" widening is not adequate for future needs, or when special conditions exist which require a detailed implementation plan. When necessary, the specific alignment plan should be prepared prior to the official submittal of the development proposal. The need for such plans will be indicated by the following:

- Variable terrain or other sensitive areas which may preclude straightforward preparation of street improvement plans.





- Alignments which are necessary because of existing street design and/or land use configurations.
- Development proposals which must deal with extraordinary physical or environmental features.

## **2. Ordinance Review**

The County Zoning Regulations and the setback portions must be reviewed and made to conform with the needs of this Element. This will insure that future construction will not interfere with present and potential highway needs. In addition, the currently established road right of ways must be analyzed to determine if these are adequate. In those areas where the present right of ways are inadequate, a program for securing such should be commenced. Requiring the dedication of right-of-way and street improvement as a condition of issuance of a Building Permit should be required, at least for any development in multiple family, commercial, and industrial zones.

The County Subdivision Ordinance should be enforced in such a manner that street and roads installed shall conform to this plan and the appropriate geometric section. If this is controlled, future widening or roadbed strengthening will not be required later at County expense.

## **3. Monitoring for Plan Compliance**

It will be the responsibility of the Department of Public Works to maintain surveillance of the Plan and the various items that might affect it. Periodic formal reviews should be conducted by the Planning Commission and the Board of Supervisors to keep it current. Generally, such a review should be held at least every five years and more often if needed. In this way, the Plan will be kept current and vital, and it will be kept visible to all areas of the public.

The Planning Department shall be responsible for advising the Department of Public Works of proposed development projects and building permit applications along designated routes. Recommendations for street improvements, including off-site improvements of road segments, intersection widenings, traffic control devices, and street lights, shall be made by DPW. For projects affecting State routes, Caltrans' input shall be sought.

## **4. Financing Alternatives**

Revenues for maintenance and construction improvements to the County Road System are mainly derived from the Gas Tax Fund and Local Transportation Authority Sales Tax Funds (Measure D).

The Gas Tax Fund is distributed to the County in accordance with formulas enacted by the State Legislative Body. The Local Transportation Authority Sales Tax Fund is a 1/2 percent sales tax specifically targeted for repairs and rehabilitation, safety improvements and construction of needed facilities. It is a Countywide tax, distributed to cities and the County, by a formula based on road mileage and population. Collection of Measure D funds began in 1990 and will terminate in the year 2009.



Other revenues are derived from vehicle code fines and miscellaneous fees. Total estimated revenue for Fiscal Year 1991 is 7.3 million dollars. Funds to provide needed capital improvements as shown on the circulation map must come from developer impact fees, Federal or State grants, or bond issues if so desired by a vote of the people.

## **5. Roadway Improvements**

### **a. Objective**

The ultimate circulation system is not in place at this time, nor is it necessary for it to be fully completed until the County and regional growth warrant it. In general, the road network will be constructed in phases consistent with the needs of the community. This section incorporates policies which will encourage the orderly development and funding of the street system. It is expected that the construction will be funded through a combination of developer contributions and fees, County funds such as gasoline tax, and state and federal subventions.

### **b. Policies**

- The County shall require dedication and improvement of necessary rights-of-way along the Circulation and Scenic Highway Plan streets. This usually will occur in fulfillment of a condition of approval for a tentative map or as a condition of approval for a building permit, whichever occurs first.
- The County shall assure that each addition to the circulation system is a usable link on the total system so that new routes and links are coordinated with existing routes to ensure that each new and existing roadway continues to function as it was intended.
- The County shall require or provide adequate traffic safety measures on all new and existing roadways. These measures may include, but not be limited to, appropriate levels of maintenance, proper street design, traffic control devices (signs, signals, and striping), street lighting, and coordination with the school districts to provide school crossing signs and protection.
- The County shall give priority to funding and implementing projects which either complete links on the circulation system, or relieve existing deficiencies.
- Where feasible, the County shall interconnect traffic signals to form area networks or corridor systems. These systems shall be timed to facilitate the flow of through traffic on the arterial system, thus enhancing the movement of vehicles and goods through the County, while reducing fuel consumption and air pollution.
- The County shall impose appropriate pro-rated fees for construction of roadway facilities and associated landscaping to ensure that all new development contributes to the completion of the circulation system. In addition to pre-permit collection, such fees may be imposed through creation of assessment districts.





- The County shall approve and build streets as per County of Imperial Design Standards.
- The County shall require additional right-of-way and additional improvements of major arterials where required for turning movements or to provide access to adjacent properties wherever access is not feasible from the lower classification street system.
- The County shall:
  - a. Require development to provide collector and local street improvements according to standards of the County Public Works Department.
  - b. Require development to dedicate necessary right-of-way when the subdivision or development of property adjacent or straddling Circulation and Scenic Highway Plan streets is proposed.
  - c. Require development to provide all necessary grading, installation of curbs, gutters, sidewalks, and parkway tree planting, unless these improvements are provided through other means.
  - d. Require development to provide half-width street improvements plus 12-feet beyond the centerline in accordance with County standards.
- If the location and traffic generation of a proposed development will result in congestion on major streets or failure to meet LOS C at peak hour periods, or if it creates safety hazards, the proposed development shall be required to make necessary off-site improvements. Such improvements may be eligible for reimbursement from collected impact fees. In some cases, the development may have to wait until financing for required off-site improvements is available. In other cases where development would result in unavoidable impacts, appropriate findings of overriding consideration would be required to allow temporary undesirable levels of service.

## **6. Transportation Demand Management**

### **a. Objective**

The transportation system envisioned for the County is a balanced system, incorporating the needs of all groups, as well as making provisions for many different modes of transportation. To accomplish this, it is necessary to implement policies encouraging a range of transportation opportunities while reducing the dependency upon automobiles.

### **b. Policies**

- The County shall encourage the reduction of vehicle miles, reduction of the total number of daily peak hour vehicular trips, and provide better utilization of the circulation system through development and implementation of Transportation Demand Management and Transportation Systems Management programs. These may include implementation of mandatory peak hour trip reduction, requirements for staggered work hours, telecommunications, increased development of employment centers where transit usage is highly viable,



encouraging ride sharing in the public and private sector, provision for park and ride facilities adjacent to the regional transportation system, and provision for transit subsidies.

- The County in its role as a major employer shall commit to the use of trip reduction and vehicle miles traveled reduction strategies identified by Transportation Demand Management and Transportation Systems Management programs.
- The County shall consider the use of bicycles during the design and implementation of the street system.
- The County shall update and maintain a recreational trails bikeway plan to recommend use of bicycle routes. These routes shall connect residential areas with schools, parks, recreation areas, major employment centers, and neighborhood commercial centers.
- The County shall require pedestrian facilities along all streets.
- The County shall require that adequate off-street parking be provided for all properties. This assumes that on-street parking will not be available on Prime, Major, or Secondary Arterials, since it is necessary in most cases to utilize curb-to-curb width for vehicular traffic, transit, and bicycle uses.
- The County shall maintain curb use priorities that consider, in descending order, the needs of through traffic, transit stops, bus turnouts, passenger loading needs, and short and long term parking.
- The County shall prohibit the use of public streets for freight loading and unloading.

## **7. Public Transit and Railway Improvements**

### **a. Objective**

An integral part of the multi-modal system is the provision for public transit and adequate rail service for freight hauling and, when feasible, passenger service. For transit service to be successful, it should be properly planned so as to be accessible to users and operate on a reasonable schedule. The following policies are intended to provide guidance in establishing a transit system and encouraging usage to serve the needs of the County and region.

### **b. Policies**

- The County shall cooperate with the IVAG and the provider of the Countywide Transit System to attain a balance of transportation opportunities. This shall include the establishment of criteria to implement transit improvements, short and long range transit service plans, corridor improvements, transit centers, and park-and-ride lots.



- The County shall require developers to construct, where appropriate, transit facilities, including bus pull-outs on arterials and bus stop amenities, including lighted shelters, benches, telephones, and route information signs.
- The County shall work with the Countywide Transit System to establish transit stops adjacent to senior housing facilities, areas with a high concentration of medical facilities, major employment centers, and retail and commercial areas.
- The County should continue to work with the Countywide Transit System, Caltrans, and appropriate agencies to plan and implement rail service between the international border crossings in Calexico and the Coachella Valley.
- The County shall encourage the use of railroad freight service to minimize long haul truck traffic by providing efficient rail freight loading access facilities.

## **8. Non-Motorized Transportation**

### **a. Objective**

The goal of this program is to enhance environmental and social benefits for the citizens of Imperial County by providing an integrated network system of bicycle and pedestrian facility for the safe and efficient movement in and through the County of Imperial.

The goal of the bicycle facilities program is to provide an integrated bicycle circulation system which includes facilities to promote the environmental and social benefits of commuter and recreational bicycling. The bicycle circulation system and associated bicycle facilities shall provide mobility and safety to all persons and areas within the County of Imperial.

The goals of the pedestrian facilities plan are:

- Provide for safe pedestrian circulation throughout the County, including sidewalks, pedestrian malls, and hiking trails.
- Provide properly designed pedestrian facilities for the handicapped and elderly population to ensure their safety and enhanced mobility.

### **b. Policies**

- Class II bikeways (on-street bike lanes) shall be planned into appropriate Prime, Major, and Secondary arterials.
- The County shall cooperate with other governmental agencies to provide connection and continuation of bicycle corridors.





- The utilization of land shall integrate the bicycle circulation system with auto, pedestrian, and transit systems.
- The County shall seek funds at the private, local, state, and federal levels for the bicycle circulation system.
- The County shall encourage the inclusion of green belts and common open space for pedestrian use within the residential development areas.
- The County shall, in accordance with state law, provide access for the handicapped and elderly to all public buildings by removal of architectural and access barriers.
- The County shall require all new development to provide handicap access.

## **9. Scenic Highway Program**

### **a. Objective**

The purpose of this program is to protect and enhance the County's scenic, historic, and recreational resources within a network of scenic highway corridors.

### **b. Policies**

- The County shall consider creation of a Scenic Highway Advisory Committee to:
  - a. Review and recommend amendments to existing ordinances, development standards, road classifications, and State Scenic Highway Law;
  - b. Initiate corridor studies and recommend additional policies, programs and specific plans for managing scenic resources; and
  - c. Review and revise Scenic Highway Program.
- The County shall provide staff assistance to the Scenic Highway Advisory Committee.
- The County shall emphasize protection of scenic highway resources in all County actions affecting land use.
- The County shall initiate a study of land use development standards for Scenic Highway Advisory Committee review.



## APPENDIX A

### GLOSSARY/DEFINITIONS

**Arterial:** A major street carrying the traffic of local and collector streets to and from freeways and other major streets, with controlled intersections and generally providing direct access to properties.

**Collector:** A street for traffic moving between arterial and local streets, generally providing direct access to properties.

**Expressway:** A highway with full or partial control of access with some intersections at grade.

**Freeway:** A highway serving high-speed traffic with no crossings interrupting the flow of traffic (i.e., no crossings at grade). Street and Highways Code Section 23.6, in part, states that "Freeway means a highway in respect to which the owners of abutting lands have no right or easement of access to or from their abutting lands or in respect to which such owners have only limited or restricted right or easement of access."

**Levels-of-Service:** According to the Transportation Research Board's 1985 *Highway Capacity Manual Special Report 209*, level-of-service is a qualitative measure describing the efficiency of a traffic stream. It also describes the way such conditions are perceived by persons traveling in a traffic stream. Levels-of-service measurements describe variables such as speed and travel time, freedom to maneuver, traffic interruptions, traveler comfort and convenience, and safety. Measurements are graduated ranging from level-of-service A (representing free flow and excellent comfort for motorist, passenger or pedestrian) to level-of-service F (reflecting highly congested traffic conditions where traffic volumes exceed the capacities of streets, sidewalks, etc.). Levels-of-service can be determined for a number of transportation factors including freeways, multi-lane highways, two-lane highways, signalized intersections, intersections that are not signalized, arterials, transit and pedestrian facilities.

**Local Scenic Highway:** A segment of a state or local highway or street that a city or county has designated as "scenic."

**Local Street:** A street providing both direct access to properties and designed for local through-traffic. Historically, these have been plotted following section and half-section lines on north/south and east/west alignments.

**Official County Scenic Highway:** A segment of a county highway the Director of the Department of Transportation (Caltrans) has designated as "scenic."

**Official State Scenic Highway:** A segment of a state highway identified in the Master Plan of State Highways Eligible for Official Scenic Highway Designation and designated by the Director of the Department of Transportation (Caltrans).





**Paratransit:** Transportation systems, such as jitneys, car pooling, van pooling, taxi service, and dial-a-ride arrangements.

**Recreational Trails:** Public areas that include pedestrian trails, bikeways, equestrian trails, boating routes, trails, and areas suitable for use by physically handicapped people, trails and areas for off-highway recreational vehicles, and cross-country skiing trails.

**Residential Street:** A street providing direct access to properties and designed to discourage through-traffic. Includes residential cul de sacs and loop streets.

**Scenic Highway Corridor:** The visible area outside the highway's right-of-way, generally described as "the view from the road."

**Scenic Thoroughfares:** The following are scenic thoroughfares terms:

**Transit:** Urban and suburban rail, bus systems and ferryboats.



## APPENDIX B

### STANDARDS FOR SCENIC HIGHWAY CORRIDOR PROTECTION

To qualify an eligible highway for Official Scenic Highway designation the local jurisdiction and/or public agencies managing the land must prepare and adopt a scenic highway corridor protection program. The standards protect and enhance the scenic aesthetic resources within view of the highway.

#### **A. Delineation of Scenic Highway Corridor**

A scenic corridor can be defined as the area of land generally adjacent to and visible from the highway. It is delineated using the following criteria:

1. Aesthetic Judgement
2. Angle and Duration of Vision from the car windows. However, where the view extends to the horizon, the boundary is located to allow control of the portion of the landscape having the greater visual impact on the traveler.

#### **B. General Plan Policy**

"The value of the state's Official Scenic Highways is recognized. The primary concern of this program is to reasonably control corridor appearance through land use regulations in the viewshed, so that the full scenic value of the area can be appreciated.

The following sections of highway in this county are listed in the *Master Plan of State Highways Eligible for Official Scenic Highway Designation*:

The County will enact ordinances to protect and enhance the scenic corridor for the enjoyment of residents and visitors, while protecting the property rights of adjacent landowners."

#### **C. Implementing Ordinances**

**Land Use Controls.** The scenic highway corridor must be protected from encroachment of inappropriate land uses.

1. Building heights and setbacks should be controlled so as not to obstruct the view from the roadway.
2. Urban type development should not be permitted in rural areas.



3. A detailed land and site review procedure should be established for the proposed developments and projects in the scenic corridor.

4. Unsightly uses (i.e. junkyards, dumps) should not be allowed.

**D. Signs and Outdoor Advertising**

1. The size, height, and type of on-premise signs allowed should be the minimum necessary for identification.
2. No off-premise outdoor advertising should be allowed in rural settings.

**E. Earthwork and Plant Material**

1. Grading or earth-moving should be done with a minimum of disturbance to the natural ground and result in naturalistic, architectural or sculptural forms.
2. Vegetative cover, preferably native to the area, and other screening devices should be provided to hide the scars and blend with the natural landscape.
3. Adequate erosion control measures should be provided in addition to those mentioned above.

**F. Utility Poles and Lines**

1. New or relocated utility distribution lines within 1,000 feet of the scenic highway should be placed underground wherever feasible.
2. When overhead lines are indispensable, poles and wires should be located to be inconspicuous from the highway.

**G. Scenic Highway Program and Process**

**What is the California Scenic Highway Program, when did it begin and what is its objective?**

The Scenic Highway Program was established by legislation (Senate Bill 1467) in 1963 to help communities to protect and enhance their natural and cultural uniqueness and beauty. It is encoded in the Streets and Highways Code (Division 1, Chapter 2, Article 2.5, Section 263).

**What is the Master Plan of State Highways Eligible for Official Scenic Highway Designation?**

SB 1467 required a "master plan" of scenic highways. The plan and a list of highways resulted from statewide public hearings in 1963. Routes which have outstanding natural or man-made features which local citizens wished to preserve were nominated for inclusion in the Master Plan. The list of scenic highways is contained in Section 263 et seq. Some highways on this list have already been





officially designated as scenic highways. The majority however, are only considered eligible for such designation.

### **How can Routes be added to the list now?**

Other routes can be added to the eligible list only through a legislative bill to amend Section 263 of Streets and Highways Code. A proposed addition should be requested by the local governing body and reviewed by Caltrans staff to the Departmental Transportation Advisory Committee (DTAC) before initiating a legislative action.

### **What is the difference between an Eligible Scenic Highway and an Officially Designated Scenic Highways?**

The status of a state scenic highway changes from eligible to officially designated at the request of the local jurisdiction and when a corridor protection program is in place and has been approved by DTAC. A certificate of official designation is issued by the Caltrans director.

### **What are the steps to receive official designation?**

If a route is on the "Master Plan of State Highways Eligible for Official Scenic Highway Designation" the following steps are necessary to receive official scenic status:

**Step 1. Submit a Resolution of Intent.** The local governing body having jurisdiction over lands adjacent to the eligible route must apply to DTAC through the local Caltrans district office. The procedure begins with preparation of a Resolution of Intent containing (a) a contour map of the corridor and its limits, (b) a description of the roadway with respect to its surrounding area and (c) an inventory of elements that make the route significant. The resolution is reviewed by DTAC and if approved the local jurisdiction proceeds to the next step.

**Step 2. Prepare a Scenic Corridor Protection Program.** A corridor can be defined as the views seen by the motorist. A corridor protection program consists of policies in the local general plan and implementing ordinances. The minimum requirements for a protection program are:

- a. regulation of land use and density of development
- b. detailed land and site planning (i.e. design review of proposed development and projects.)
- c. control of outdoor advertising
- d. careful attention to and control of earth moving and landscaping
- e. review of the design and appearance of structures and equipment
- f. undergrounding of new or relocated utility poles and lines, if feasible



DTAC reviews the request for official designation, the protection program, a visual presentation of the highway and the district scenic highway coordinator's recommendations.

**Step 3. Designation.** Upon a positive recommendation, the Caltrans director issues a certificate of official scenic designation.

**Is there special funding for the Scenic Highway Program?**

No, at this time, scenic highways do not receive additional funds or funding priority.

**Can Scenic Highways be widened or otherwise changed?**

There are no restrictions for making improvements on scenic highways. The impact of a construction project on the visual appearance of the landscape should, however, be considered. Standards for earthmoving and landscaping are a part of the corridor protection ordinances for officially designated scenic highways.

**Do maintenance costs increase?**

No, Caltrans maintains the highway in the normal manner. The only additional costs to Caltrans are for installation and maintenance of the scenic route markers (signs with a poppy emblem) along officially designated scenic highways.

**Does Caltrans promote scenic highways to the public?**

No, the state highway map published by the California Office of Tourism shows the officially designated scenic highways. Officially designated scenic highways are indicated by a "poppy sign" on maps produced by AAA. Other promotions are carried on locally.

**What advantages does Official Designation offer?**

Advantage applicable to Imperial County are the ability to better control development along a corridor, reduce proliferation of billboards along a highway, and attract tourists to an area.







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noise element

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## IMPERIAL COUNTY GENERAL PLAN NOISE ELEMENT

### I. INTRODUCTION

#### A. Preface

The Noise Element of the General Plan is a mandatory component of all general plans pursuant to the State Government Code, Section 65302. The State guidelines, Section 65302(f), specify the content of the Noise Element, which includes the requirement to analyze, to the extent practicable, the current and projected noise levels of:

- Highways and freeways;
- Primary arterials and major local streets;
- Passenger and freight on-line railroad operations and ground rapid transit systems;
- Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation;
- Local industrial plants, including, but not limited to railroad classification yards; and
- Other ground stationary noise sources identified by local agencies as contributing to the community noise environment.

The Noise Element must delineate noise contours for the above noise sources, which shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise. The Noise Element must identify and appraise noise problems in the planning area and provide policy programs to avoid potential noise problems. Policies established in the Noise Element is applicable to lands that are owned or zoned by the County; lands regulated by the State or Federal government are preempted from local land use policy.

#### B. Purpose of the Noise Element

Noise is generally defined as unwanted sound. Exposure to noise can result in interference with speech, distractions at home and at work, disturbance of rest and sleep, and the disruption of various recreational pursuits. Long-term exposure to high noise levels can affect psychological and physiological health. The Noise Element of the Imperial County General Plan provides a program for incorporating noise issues into the land use planning process, with a goal of minimizing adverse noise impacts to receptors which are sensitive to noise.



The Noise Element identifies existing and future noise sources, and defines noise-sensitive land uses. The element establishes goals, objectives and procedures to protect the public from noise intrusion. Implementation of these guidelines and procedures will promote the development of noise sensitive land uses outside of noise impact zones, and discourage the development of noise generating activities near noise-sensitive land uses.

The description of noise requires the use of terms which may not be familiar to most readers of this General Plan. Terms are described briefly in the text. Appendix A is a glossary of terms to assist the reader of the Noise Element.

### C. Noise Measurement

Noise is a form of energy. A standard unit of measure of the noise level, or sound pressure level, is the decibel (dB). Sound is also described by frequency, or pitch, and comprehensive measurements describe the sound level for each specified frequency range. For the assessment of noise levels to a human receptor, the frequency range measurements are combined into a single value, the "A-weighted" decibel, often written dB(A) or dBA. A-weighting gives values to the individual frequencies which correspond to the human hearing spectrum. In this noise element, the use of the term dB means the A-weighted decibel. Table 1 provides examples of various sound levels.

Noise is measured with a sound level meter. This instrument includes a microphone, amplifiers, frequency weighting circuitry, readout and, usually, a means for recording and averaging data. Sound level meters should meet the specifications of the American National Standards Institute, ANSI S1-4, 1983 or later, for Type I or Type II instruments.

**Average Noise Levels.** The most commonly used short-term average is  $L_{eq}$ , the equivalent noise level. When  $L_{eq}$  is used, a time for averaging may be stated, such as 15 minutes, 1 hour, 8 hours or 24 hours. If no time is stated, a one hour average is assumed.  $L_{eq}$  is usually used in the description of noise near a point source or group of sources, such as a tractor or a construction site. Policies and ordinances which regulate noise at the source are usually stated in terms of  $L_{eq}$ .

**Community Noise Levels.** Community noise is a term used to describe the outdoor noise environment in the vicinity of inhabited areas. Community noise is generally a combination of noise from varied and widespread sources, such as highways and railroads. Community noise usually varies in time, with the cyclic pace of noise-making activities. Therefore, an averaging of the noise level over a period of time is necessary to describe community noise levels. Further, the sensitivity to noise in the community varies during the day. People are less sensitive to noise when they are engaged in activities which in themselves make noise, such as recreation, than when they are engaged in quiet activities, such as sleeping.

The long term averages used for the assessment of community noise are the Community Noise Equivalent Level, CNEL, and the Day-Night Level,  $L_{dn}$  or DNL. These averages weight the noise levels over a 24-hour period to account for increased human sensitivity during the evening and night





**TABLE 1**  
**TYPICAL SOUND LEVELS**

Sound Level (dB)	Community/Outdoor	Industry/Home Indoor	Impression/Effect
130			
	Jet takeoff (200')		Threshold of Pain (130-140 dB)
120			
110	Chainsaw (2')	Discotheque	
100	Pile driver (50')		
90	Power mower Heavy truck (50')	Boiler room	Hearing damage (8 hour exposure)
80	Concrete mixer (50')	Garbage disposal	Loud/annoying
70	Freeway (100')	Noisy restaurant	Shouting required at 3 feet
60	Air conditioner unit	Department store	Loud speech required at 3 feet
50	Light auto traffic (100')	Quiet office	Normal speech at 3 feet Disturbs sleep
40	Bird calls	Library	Quite
	Soft whisper (6')		
30		Quiet bedroom	
20	North rim of Grand Canyon	Recording studio	
10			Threshold of hearing

time periods. The difference between CNEL and  $L_{dn}$  is that CNEL considers the 24-hour day divided into three periods, while  $L_{dn}$  uses two periods. The two measurements are very close, and are generally accepted as equivalent in community noise studies.  $L_{dn}$  is the measure used by the U.S. Environmental Protection Agency (EPA) for a community noise descriptor, while CNEL is commonly used in California. The Imperial County General Plan Noise Element uses CNEL.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

Many activities which create objectionable noise levels in Imperial County, such as industrial operations and rail switching yards, are located within cities which are not a part of the County General. The highest traffic volumes, which are major noise sources, are within the cities of El Centro and Calexico. This section addresses only noise sources which affect unincorporated areas of the County. Information for this analysis was compiled from documents and reports on file at the County Planning Department.

### **B. Noise Sources**

The principal noise sources in Imperial County are the transportation sources, aircraft, rail lines, and motor vehicle; the industrial sources, which include rail switching yards, utilities, and manufacturing facilities; and agricultural operations. In rural areas of the County, mining and off-road vehicle activity also create significant noise, but generally in areas without noise sensitive receptors.

#### **1. Transportation Sources**

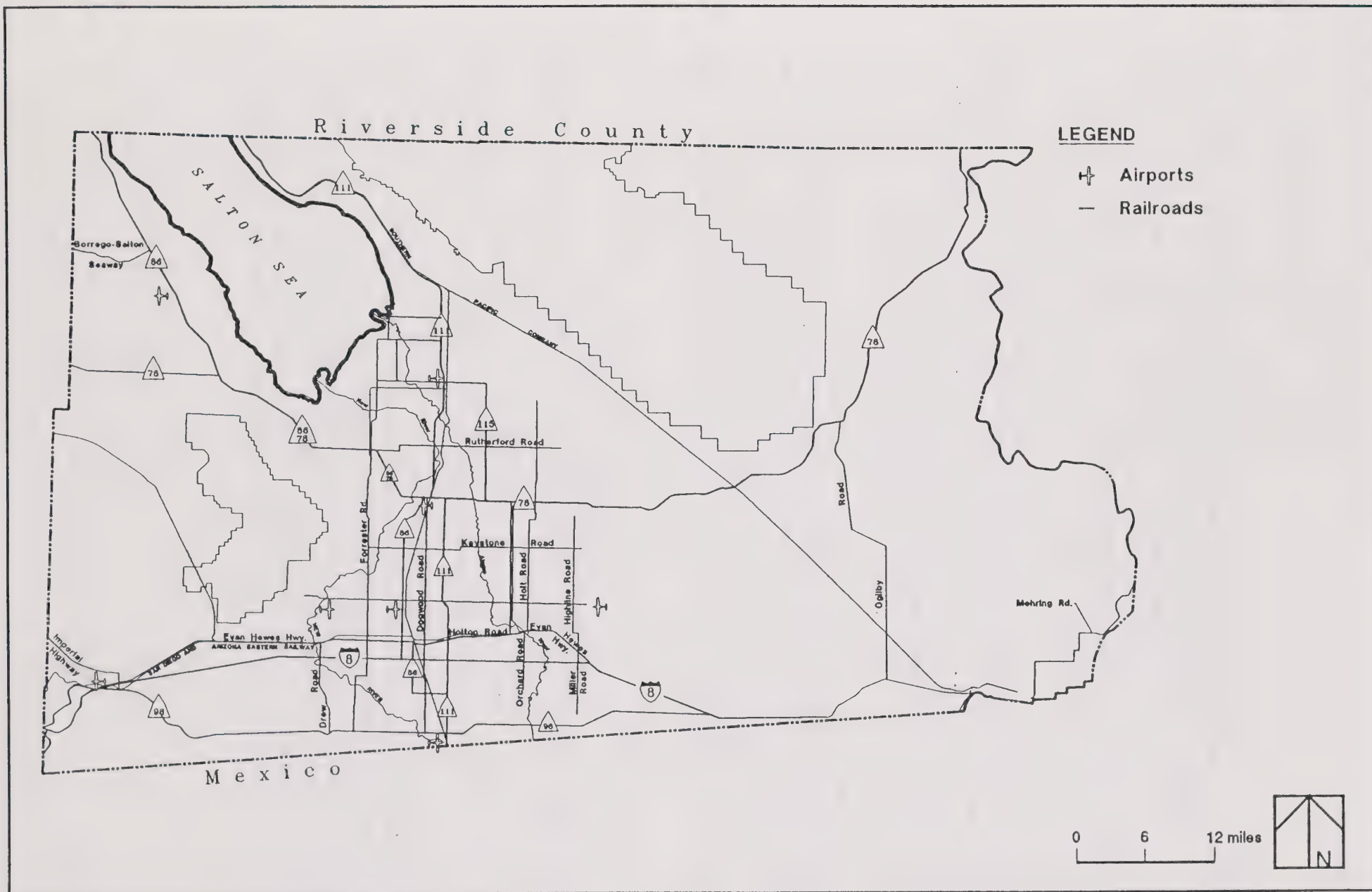
##### **a. Aircraft Noise**

Aircraft noise which may affect sensitive land uses occurs in the vicinity of seven airports in the County: Imperial County, Brawley Municipal, Calexico International, Calipatria Municipal, Holtville, Salton Sea, and the Naval Air Facility (NAF) El Centro which is located north of the townsite of Seeley. The locations of these airports are shown in Figure 1. The noise levels and associated areas of noise impact are quantified in noise contour maps which usually are products of FAA-mandated noise surveys or Airport Land Use Plans. Appendix B contains the most recent existing noise contour maps for Brawley Municipal Airport and NAF El Centro airports.

Future airport noise levels for Brawley Municipal, Calexico International, Calipatria Municipal, and Imperial County airports, and NAF El Centro are shown on contour maps in Appendix B. These maps are taken from the *Airport Land Use Compatibility Plan, Imperial County Airports* (ALUCP 1991). The Airport Land Use Compatibility Plan indicates that future noise contours for the Holtville and Salton Sea airports have not been determined. At the present time, Holtville Airport has no facilities other than its large runway, and its use is limited to irregular operations from military facilities at El Centro and Yuma. The future use of the airport is uncertain (ALUCP 1991). Current airport activity at Salton Sea Airport is negligible. An expansion plan for the airport exists; implementation in the foreseeable future is unlikely (ALUCP 1991).

Aircraft noises occur as part of agricultural operations, where aircraft are used for crop spraying operations.





Imperial County  
General Plan

Existing Noise Sources

Noise Element

Figure  
1





## b. Railroad Noise

The Southern Pacific Railway is the primary source of railroad transportation noise in the County. The main line right-of-way runs from the Riverside County border, just east of the Salton Sea, southeast to Niland. From Niland, the main line continues southeast to Yuma, Arizona; a branch runs south to Calipatria, Brawley, Imperial, El Centro and Calexico. A spur on this line runs east from El Centro along Evan Hewes Highway to Holtville and north along SR 115 to just south of Highway 78. This spur is used primarily for agricultural transport, such as sugar beets from fields west of Holtville. The railroad lines are shown in Figure 1.

Two other railways, which are located west of Seeley, are the U.S. Gypsum rail line to their mining site in the Fish Creek Mountains; and the San Diego and Eastern Railroad (S.D.& A.E.) from San Diego through the Jacumba Mountains. The U.S. Gypsum line passes through uninhabited areas, including a military bombing range and does not impact sensitive receivers. The S.D.& A.E. line has been non-operational east of Jacumba to Plaster City following Tropical Storm Kathleen in 1976 which destroyed tracks and bridges along much of its route.

Railroad noise on the Southern Pacific line, just north of the Riverside County border, was studied in 1990. A combination of measurements, operations data (from 1988) and modeling resulted in the data shown in Table 2. Operations data in 1992, for the main Southern Pacific line, are similar to that of 1988 (i.e., an average of about 40 trains per day), and Table 2 would apply to existing conditions. Railroad noise from the spur tracks would be much less. The branch to Imperial and Calexico averages four trains per day. The spur to Holtville averages four trains per week.

**TABLE 2**  
**EXISTING RAILROAD NOISE LEVELS**

Distance (ft)	100	200	300	400	500	700	1,000	2,000	5,000
CNEL (dBA)	74	70	67	64	62	60	57	51	44

Two proposed projects could add spurs to the existing railway network. A proposed new international border crossing and bi-national industrial area east of Calexico could include a rail spur. The route of the spur could be east-west from Calexico or north-south from Holtville, dependent on availability of right-of-way and accompanying land use, environmental and economic considerations. A second proposed project is the Mesquite Landfill, which would require a spur near Glamis, running northwesterly for a distance of four to five miles. This spur would dead-end at the landfill, and be used exclusively for the transportation of solid waste.



### c. Roadway Noise

Motor vehicle noise level information is obtained from measurements using a sound level meter, and is calculated using highway traffic volume, speed, and vehicle mix information. Figure 1 shows the location of existing principal roadways within Imperial County. The major east-west roadway in the county is Interstate 8 (I-8), which runs from Yuma, Arizona to San Diego County, through the city of El Centro.

State Route (SR) 98 parallels I-8 on the south to serve the city of Calexico and the community of Ocotillo. SR 78 parallels I-8 to the north, and serves the cities of Westmorland and Brawley, and continues northeast to the community of Palo Verde. The Evan Hewes Highway is Old Highway 80 which parallels I-8 on the north from Ocotillo to Seeley, El Centro, and Holtville, then back southeast to again join I-8.

SR 86 and SR 111 are the main north-south roadways. SR 86 runs from SR 111 north of Calexico, through Heber and the cities of El Centro, Imperial, Brawley and Westmorland and northward to eventually connect with Interstate 10 at Indio. It is a principal farm-to-market route for Imperial County agricultural products, and carries a high percentage of heavy trucks. SR 86 also carries heavy recreational traffic on weekends. SR 111 is located east of El Centro from Calexico to the cities of Brawley and Calipatria; and continues north along the east side of the Salton Sea past Niland and Bombay Beach to also connect with I-10 at Indio.

Other state roads include SR 115, which runs northwest from I-8 to Holtville, then north to Brawley and Calipatria; and SR 186, a short spur running south from the eastern end of I-8 to the international border.

Table 3 lists the interstate and state highways in Imperial County, and shows the vehicle volumes, mixes, and calculated noise levels. Traffic volumes are from the Circulation/Scenic Highway Element; vehicle mixes are from Caltrans 1990 data. Due to the relative low volumes on most of the roadways in the unincorporated area of the County, noise contours would not be distinguishable at a scale which could be included with this Noise Element. A large scale map (1"=2 miles) with noise contours has been provided and is on file at the County Planning Department. More detailed descriptions of the state highways and local roadways may be found in the Circulation/Scenic Highway Element of the General Plan.

A new state highway is planned for south central Imperial County. SR 7 will provide a north-south connection from SR98 to a planned border crossing and bi-national industrial area east of Calexico. SR 7 may continue north to connect with I-8. Improvements are planned to SR 86 which is expected to follow a more westerly alignment from south of Salton City to reconnect with existing SR 86 southwest of Brawley. Improvements to, and addition of non-State roads to the Imperial County roadway system are described in the Circulation Element.





**TABLE 3**  
**IMPERIAL COUNTY INTERSTATE AND STATE HIGHWAY TRAFFIC AND NOISE DATA**  
**(EXISTING CONDITIONS)**

Road Segment	Traffic					Noise			
	Volume (thousands)	Speed (mph)	Vehicle Mix (percent)			Reference CNEL dB	Distance to ____ dB		
			Auto	Med	Heavy		70 feet	65 feet	60 feet
I-8									
w/o Ocotillo	10.7	65	84	4.8	11.2	76	180	565	1605
e/o Ocotillo	8.6	65	84	4.8	11.2	75	145	455	1355
w/o El Centro	10.9	65	87	4.0	9.0	75	170	525	1455
e/o El Centro	22.9	65	89	3.4	7.6	78	325	1005	2205
e/o 111	8.4	65	83	5.0	12.0	75	145	455	1355
w/o 115	6.5	65	81	4.8	14.2	74	125	380	1155
e/o 115	7.2	65	77	4.6	18.4	75	160	495	1405
e/o 98	8.7	65	80	4.4	15.6	75	170	530	1505
w/o 186	10.7	65	80	4.4	15.6	76	215	655	1705
e/o 186	14.0	65	80	4.4	15.6	77	275	855	2005
SR-78									
w/o 86	0.6	55	66	6.1	27.9	64	*	*	135
e/o 111S	3.5	55	70	2.1	27.9	72	80	240	775
e/o 115S	1.5	55	73	7.0	20.0	67	*	85	275
SR-86									
w/o 111	4.3	55	93	4.8	2.2	68	*	105	315
s/o 8	9.2	55	94	4.1	1.9	71	70	205	630
s/o 78E	13.5	55	90	4.8	5.2	74	130	385	1180
nw/o Brawley	5.3	55	78	6.8	15.2	72	85	245	780
s/o 78W	4.6	55	52	5.1	42.9	75	150	465	1380
n/o 78W	4.1	55	52	5.0	43.0	74	135	410	1225
SR-98									
e/o Ocotillo	1.8	55	89	4.6	6.4	65	*	55	175
w/o Drew	2.1	55	89	2.6	8.4	66	*	70	220



**TABLE 3**  
**IMPERIAL COUNTY INTERSTATE AND STATE HIGHWAY TRAFFIC AND NOISE DATA**  
**(EXISTING CONDITIONS)**

Road Segment	Traffic					Noise			
	Volume (thousands)	Speed (mph)	Vehicle Mix (percent)			Reference CNEL dB	Distance to ____ dB		
			Auto	Med	Heavy		70 feet	65 feet	60 feet
w/o 111	12.0	55	93	2.8	4.2	73	95	300	950
w/o 8	0.9	55	77	2.3	20.7	65	*	50	160
<b>SR-111</b>									
s/o 86W	25.0	55	92	4.4	3.6	76	205	635	1655
s/o 8	22.0	55	93	3.7	3.3	75	170	535	1505
n/o 8	9.5	55	87	5.9	7.1	73	100	310	980
s/o 78	6.9	55	84	7.2	8.8	72	80	240	775
n/o 78	7.1	55	82	7.5	10.5	73	90	285	900
s/o 115	7.1	55	79	7.5	13.5	73	100	210	980
n/o 115	5.6	55	82	7.5	10.5	72	70	225	700
s/o Riv. Cty.	3.5	55	71	12.2	16.8	71	60	190	600
<b>SR-115</b>									
n/o 8	2.1	55	63	9.3	27.7	70	49	155	485
s/o 78	2.7	55	68	7.9	24.1	70	55	175	560
n/o 78	1.3	55	18	19.7	62.3	71	60	185	590
<b>SR-186</b>	2.0	55	90	8.8	1.2	65	*	50	150
"**" indicates contour lies within the right-of-way All calculations assume flat hard terrain with no obstructions; actual conditions									

Table 4 shows the projected future noise for Interstate 8 and the state highways in Imperial County. The future volumes are from the Circulation/Scenic Highway Element; vehicle mix parameters are the same as those used for existing conditions. Roadway noise may increase 3 dB CNEL for many sections, and up to 6 dB CNEL for a few sections. Table 4 indicates that the 60 dB CNEL contour may move considerably farther from existing roadways than at present, thus exposing existing and potential sensitive receptors to greater noise levels.



**TABLE 4**  
**IMPERIAL COUNTY INTERSTATE AND STATE HIGHWAY TRAFFIC AND NOISE DATA**  
**(FUTURE/YEAR 2015 CONDITIONS)**

Road Segment	Traffic Volume (thousands)	Noise				Increases	
		Reference CNEL dB	Distance to __ dB			CNEL dB	Distance to 60 CNEL feet
			70 feet	65 feet	60 feet		
I-8							
w/o Ocotillo	26.1	79	440	1300	2600	3	995
e/o Ocotillo	18.3	78	310	970	2150	3	795
w/o El Centro	29.2	79	445	1310	2625	4	1170
e/o El Centro	50.4	81	705	1790	3230	3	1025
e/o 111	15.9	77	280	870	2020	2	665
w/o 115	12.7	77	240	755	1850	3	695
e/o 115	14.1	78	305	960	2120	3	715
e/o 98	13.9	77	275	865	2010	2	505
w/o 186	21.5	79	425	1255	2560	3	855
e/o 186	37.5	82	735	1840	3290	5	1285
SR-78							
w/o 86	1.6	69	*	114	362	5	227
e/o 111S	6.0	74	130	412	1230	2	455
e/o 115S	3.0	70	55	172	545	3	270
SR-86							
w/o 111	6.0	69	44	137	435	1	120
s/o 8	26.9	76	186	590	1600	5	970
s/o 78E	20.0	76	180	570	1560	2	380
nw/o Brawley	7.7	74	118	372	1145	2	365
s/o 78W	17.6	80	550	1520	2905	5	1525
n/o 78W	9.9	78	310	975	2160	3	755
SR-98							
e/o Ocotillo	6.1	71	59	187	590	6	415
w/o Drew	7.1	72	74	234	740	6	520
w/o 111	26.1	76	209	660	1710	3	760
w/o 8	1.1	66	*	61	193	1	33
SR-111							
s/o 86W	43.0	78	349	1075	2305	2	650
s/o 8	37.8	78	294	920	2095	3	590
n/o 8	16.3	75	168	532	1480	2	500





**TABLE 4**  
**IMPERIAL COUNTY INTERSTATE AND STATE HIGHWAY TRAFFIC AND NOISE DATA**  
**(FUTURE/YEAR 2015 CONDITIONS)**

Road Segment	Traffic Volume (thousands)	Noise				Increases	
		Reference CNEL dB	Distance to __ dB			CNEL dB	Distance to 60 CNEL feet
			70 feet	65 feet	60 feet		
s/o 78	11.9	74	138	438	1290	2	515
n/o 78	16.3	76	206	655	1685	3	785
s/o 115	17.0	77	246	780	1890	4	910
n/o 115	14.3	76	182	576	1565	4	865
s/o Riv. Cty.	6.7	74	116	369	1130	3	530
<b>SR-115</b>							
n/o 8	3.5	72	81	257	810	5	535
s/o 78	3.7	72	77	243	765	2	205
n/o 78	3.4	75	155	490	1400	4	810
<b>SR-186</b>	4.4	68	*	104	330	3	180
"**" indicates contour lies within the right-of-way. All calculations assume flat hard terrain with no obstructions; actual conditions may reduce noise significantly.							

## 2. Industrial Sources

Manufacturing and utility operations often emit noise which may impact sensitive receptors in the area of the plant. Existing major manufacturing sites within Imperial County are generally located away from concentrations of sensitive receptors. These include a gypsum plant in Plaster City, Holly Sugar and Calcot between Imperial and Brawley, and geothermal power plants in the southeast Salton Sea, Heber, and East Mesa areas. Additional geothermal plants are planned. Figure 1 includes the location of existing geothermal plants and areas where future plants may be located. More detailed descriptions of the geothermal plants may be found in the Geothermal and Transmission Element of the General Plan.

## 3. Agricultural Sources

The predominant land use in Imperial County is agriculture. Noise sources associated with agricultural operations include the field machinery, especially when diesel engine driven; heavy trucks, used for the delivery of supplies and the distribution of products; and aircraft, used for the spraying of crops.



#### **4. Other Sources**

Noise sources not included above which are likely to be included in planning analyses include: construction noise; noise from commercial activities, such as automotive and truck repair, kennels, and entertainment facilities; noise from building heating, ventilating, and air conditioning (HVAC) systems; and noise from recreational areas, including off-road vehicles.

Noise from residential stereos, tools, parties and pets can be a source of noise complaints. This type of noise is not addressed in planning activities, but in ordinances specifically for controlling nuisance noise or generally for maintaining the peace.

#### **C. Sensitive Receptors**

Sensitive noise receptors are, in general, areas of habitation where the intrusion of noise has the potential to impact adversely the occupancy, use or enjoyment of the environment. Sensitive receptors include, but are not limited to, residences, schools, hospitals, parks and office buildings.

Sensitive receptors may also be non-human species. Many riparian bird species are sensitive to excessive noise.





### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Noise Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing policies to maintain and improve the noise environment in Imperial County. This section of the Noise Element presents Imperial County's Goals and Objectives relative to planning for the noise environment within the unincorporated areas of the County. They have been prepared in collaboration with the General Plan Ad-Hoc Advisory Committee appointed by the Board of Supervisors.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development and industry as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for decision making relative to proposed projects and land use planning. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in decisions relative to environmental protection and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Noise Environment**

Goal 1: Provide an acceptable noise environment for existing and future residents in Imperial County.

Objective 1.1 Adopt noise standards which protect sensitive noise receptors from adverse impact.

Objective 1.2 Ensure that noise standards and policies are compatible with the standards and policies of other General Plan Elements and other County agencies.

Objective 1.3 Control noise levels at the source where feasible.

Objective 1.4 Coordinate with airport operators to ensure operations are in conformance with approved Airport Land Use Plans.

Objective 1.5 Identify sensitive receptors with noise environments which are less than acceptable, and evaluate measures to improve the noise environment.



Objective 1.6 Collect data for existing noise sources in the County in order to improve the data base and enhance the ability to evaluate proposed projects and land uses.

### **Project/Land Use Planning**

Goal 2: Review proposed projects for noise impacts and require design which will provide acceptable indoor and outdoor noise environments.

Objective 2.1 Adopt criteria delineating projects which should be analyzed for noise impact to sensitive receptors.

Objective 2.2 Provide acoustical analysis guidelines which minimize the burden on project proponents and project reviewers.

Objective 2.3 Work with project proponents to utilize site planning, architectural design, construction, and noise barriers to reduce noise impacts as projects are proposed.

### **Long Range Planning**

Goal 3: Provide for environmental noise analysis inclusion in long range planning activities which affect the County.

Objective 3.1 Adopt procedures for the preparation of Specific Plans which include the requirement for a noise impact analysis.

Objective 3.2 Coordinate regularly with Caltrans to obtain information on trends and plans for roadway changes and improvements which would affect the noise environment.

### **C. Relationship to Other General Plan Elements**

The Noise Element Policy Matrix (Table 5) identifies the relationship between the Noise Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 5 NOISE ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Seismic/ Public Safety	Agricultural	Open Space Conservation	Geothermal	Water
Noise Environment						X		
Land Use Planning	X		X					



## IV. IMPLEMENTATION PROGRAMS AND POLICIES

### A. Preface

The primary mechanism to implement the noise goals and objectives is to incorporate noise concerns into land use planning and the planning of noise-producing projects. Future noise/land use incompatibilities can be avoided or reduced by establishing criteria and standards for acceptable noise limits for various land uses throughout the County. It may not always be possible to avoid constructing noise sensitive developments in existing noisy areas. Therefore, this Element provides noise reduction strategies to be implemented in situations with potential noise/land use conflicts.

The first part of the implementation program identifies Noise Impact Zones for significant noise generators, where analysis of noise impacts must be performed. The standards to be applied in noise analyses and their evaluation are stated. Subsequent sections define programs for proposed projects, existing noise sources and noise reduction.

### B. Noise Impact Zones

A Noise Impact Zone is an area that is likely to be exposed to significant noise. The County of Imperial defines a Noise Impact Zone as an area which may be exposed to noise greater than 60 dB CNEL or 75 dB  $L_{eq}(1)$ . The purpose of the Noise Impact Zone is to define areas and properties where an acoustical analysis of a proposed project is required to demonstrate project compliance with land use compatibility requirements and other applicable environmental noise standards. For purposes of this Element, any property meeting one of the following criteria is defined as being in a Noise Impact Zone:

- Within the noise impact zone distances to classified roadways, as indicated in Table 6.

TABLE 6 ROADWAY NOISE IMPACT ZONES	
Roadway Classification	Distance from Centerline - feet
Interstate	1,500
State Highway or Prime Arterial	1,100
Major Arterial	750
Secondary Arterial	450
Collector Street	150

- Within 750 feet of the centerline of any railroad.
- Within 1,000 feet of the boundary of any railroad switching yard.





- Within the existing or projected 60 dB CNEL contour of any airport, as shown in the Imperial County Airport Land Use Compatibility Plan or an approved airport master plan which supersedes the ALUCP. Note: Land use compatibility analysis, which may include an acoustical analysis, is required for projects proposed within the "airport vicinity" of each airport, as defined on the Compatibility Maps shown in the ALUCP. This may encompass a much larger area than the 60 dB CNEL contour.
- Within one-quarter mile (1,320 feet) of existing farmland which is in an agricultural zone.

### **C. Noise/Land Use Compatibility Standards**

Land Use compatibility defines the acceptability of a land use in a specified noise environment. Table 7 provides the County of Imperial Noise/Land Use Compatibility Guidelines. When an acoustical analysis is performed, conformance of the proposed project with the Noise/Land Use Compatibility Guidelines will be used to evaluate potential noise impact and will provide criteria for environmental impact findings and conditions for project approval.

Table 8 provides the ALUCP Noise/Land Use Compatibility Criteria, which must be used to evaluate aircraft noise impacts. Noise standards associated with the construction and operation of geothermal power stations are included in Appendix B to the Geothermal and Transmission Element of the General Plan.

#### **1. Interior Noise Standards**

The California Noise Insulation Standards, California Code of Regulations Title 24, establishes a maximum interior noise level, with windows closed, of 45 dB CNEL, due to exterior sources. This requirement is applicable to new hotels, motels, apartment houses and dwellings other than detached single-family dwellings.

The County of Imperial hereby establishes the following additional interior noise standards to be considered in acoustical analyses.

- The interior noise standard for detached single family dwellings shall be 45 dB CNEL.
- The interior noise standard for schools, libraries, offices and other noise-sensitive areas where the occupancy is normally only in the day time, shall be 50 dB averaged over a one-hour period ( $L_{eq}(1)$ ).



TABLE 7  
NOISE/LAND USE COMPATIBILITY GUIDELINES

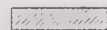
Land Use Category	Community Noise Exposure $L_{dn}$ or CNEL, dB					
	55	60	65	70	75	80
Residential	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Transient Lodging-Motels, Hotels	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Schools, Libraries, Churches, Hospitals, Nursing Homes	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Auditoriums, Concert Halls, Amphitheaters	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Sports Arena, Outdoor Spectator Sports	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Playgrounds, Neighborhood Parks	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Golf Courses, Riding Stables, Water Recreation, Cemeteries	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Office Buildings, Business Commercial and Professional	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	
Industrial, Manufacturing Utilities, Agriculture	Normally Acceptable		Conditionally Acceptable		Normally Unacceptable	

Interpretation (For Land Use Planning Purposes)



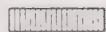
Normally Acceptable

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.



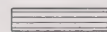
Conditionally Acceptable

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design.



Normally Unacceptable

New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.



Clearly Unacceptable

New construction or development clearly should not be undertaken.





**TABLE 8**  
**NOISE COMPATIBILITY CRITERIA**

Land Use Category	CNEL, dBA				
	50-55	55-60	60-65	65-70	70-75
<b>Residential</b>					
single family, nursing homes, mobile homes	+	o	-	--	--
multi-family, apartments, condominiums	++	+	o	-	--
<b>Public</b>					
schools, libraries, hospitals	+	o	-	--	--
churches, auditoriums, concert halls	+	o	o	-	--
transportation, parking, cemeteries	++	++	++	+	o
<b>Commercial and Industrial</b>					
offices, retail trade	++	+	o	o	-
service commercial, wholesale trade, warehousing, light industrial	++	++	+	o	o
general manufacturing, utilities, extractive industry	++	++	++	+	+
<b>Agricultural and Recreational</b>					
cropland	++	++	++	++	+
livestock breeding	++	+	o	o	-
parks, playgrounds, zoos	++	+	+	o	-
golf courses, riding stables, water recreation	++	++	+	o	o
outdoor spectator sports	++	++	+	o	o
amphitheaters	+	o	-	--	--
++ Clearly Acceptable	The activities associated with the specified land use can be carried out with essentially no interference from the noise exposure.				
+ Normally Acceptable	Noise is a factor to be considered in that slight interference with outdoor activities may occur. Conventional construction methods will eliminate most noise intrusions upon indoor activities.				
o Marginally Acceptable	The indicated noise exposure will cause moderate interference with outdoor activities and with indoor activities when windows are open. The land use is acceptable on the conditions that outdoor activities are minimal and construction features which provide sufficient noise attenuation are used (e.g., installation of air conditioning so that windows can be kept closed). Under other circumstances, the land use should be discouraged.				
- Normally Unacceptable	Noise will create substantial interference with both outdoor and indoor activities. Noise intrusion upon indoor activities can be mitigated by requiring special noise insulation construction. Land uses which have conventionally constructed structures and/or involve outdoor activities which would be disrupted by noise should generally be avoided.				
-- Clearly Unacceptable	Unacceptable noise intrusion upon land use activities will occur. Adequate structural noise insulation is not practical under most circumstances. The indicated land use should be avoided unless strong overriding factors prevail and it should be prohibited if outdoor activities are involved.				



## 2. Property Line Noise Standards

The Property Line Noise Limits listed in Table 9 shall apply to noise generation from one property to an adjacent property. The standards imply the existence of a sensitive receptor on the adjacent, or receiving, property. In the absence of a sensitive receptor, an exception or variance to the standards may be appropriate. These standards do not apply to construction noise.

These standards are intended to be enforced through the County's code enforcement program on the basis of complaints received from persons impacted by excessive noise. It must be acknowledged that a noise nuisance may occur even though an objective measurement with a sound level meter is not available. In such cases, the County may act to restrict disturbing, excessive, or offensive noise which causes discomfort or annoyance to reasonable persons of normal sensitivity residing in an area.

**TABLE 9  
PROPERTY LINE NOISE LIMITS**

Zone	Time	Applicable Limit One-hour Average Sound Level (Decibels)
Residential Zones	7 a.m. to 10 p.m.	50
	10 p.m. to 7 a.m.	45
Multi-residential Zones	7 a.m. to 10 p.m.	55
	10 p.m. to 7 a.m.	50
Commercial Zones	7 a.m. to 10 p.m.	60
	10 p.m. to 7 a.m.	55
Light Industrial/Industrial Park Zones	Anytime	70
General Industrial Zones	Anytime	75

Note: When the noise-generating property and the receiving property have different uses, the more restrictive standard shall apply. When the ambient noise level is equal to or exceeds the Property Line noise standard, the increase of the existing or proposed noise shall not exceed 3 dB  $L_{eq}$ .

## 3. Construction Noise Standards

Construction noise, from a single piece of equipment or a combination of equipment, shall not exceed 75 dB  $L_{eq}$ , when averaged over an eight (8) hour period, and measured at the nearest sensitive receptor. This standard assumes a construction period, relative to an individual





sensitive receptor of days or weeks. In cases of extended length construction times, the standard may be tightened so as not to exceed 75 dB  $L_{eq}$  when averaged over a one (1) hour period.

Construction equipment operation shall be limited to the hours of 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 p.m. Saturday. No commercial construction operations are permitted on Sunday or holidays. In cases of a person constructing or modifying a residence for himself/herself, and if the work is not being performed as a business, construction equipment operations may be performed on Sundays and holidays between the hours of 9 a.m. and 5 p.m. Such non-commercial construction activities may be further restricted where disturbing, excessive, or offensive noise causes discomfort or annoyance to reasonable persons of normal sensitivity residing in an area.

#### **4. Significant Increase of Ambient Noise Levels**

The increase of noise levels generally results in an adverse impact to the noise environment. The Noise/Land Use Compatibility Guidelines are not intended to allow the increase of ambient noise levels up to the maximum without consideration of feasible noise reduction measures. The following guidelines are established by the County of Imperial for the evaluation of significant noise impact.

- a. If the future noise level after the project is completed will be within the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, but will result in an increase of 5 dB CNEL or greater, the project will have a potentially significant noise impact and mitigation measures must be considered.
- b. If the future noise level after the project is completed will be greater than the "normally acceptable" noise levels shown in the Noise/Land Use Compatibility Guidelines, a noise increase of 3 dB CNEL or greater shall be considered a potentially significant noise impact and mitigation measures must be considered.

#### **D. Programs and Policies**

##### **1. Acoustical Analysis of Proposed Projects**

The County shall require the analysis of proposed discretionary projects which may generate excessive noise or which may be impacted by existing excessive noise levels, including but not limited to the following:

- An analysis shall be required for any project which would be located, all or in part, in a Noise Impact Zone as specified above.
- An analysis shall be required for any project which has the potential to generate noise in excess of the Property Line Noise Limits stated in Table 9.





- An analysis shall be required for any project which, although not located in a Noise Impact Zone, has the potential to result in a significant increase in noise levels to sensitive receptors in the community.

An acoustical analysis and report shall be prepared by a person deemed qualified by the Director of Planning. The report shall describe the existing noise environment, the proposed project, the projected noise impact and, if required, the proposed mitigation to ensure conformance with applicable standards.

## **2. Noise/Land Use Compatibility**

Where acoustical analysis of a proposed project is required, the County shall identify and evaluate potential noise/land use conflicts that could result from the implementation of the project. Projects which result in noise levels that exceed the "Normally Acceptable" criteria of the Noise/Land Use Compatibility Guidelines, Table 7, shall include mitigation measures to eliminate or reduce to an acceptable level the adverse noise impacts.

## **3. Agricultural Noise/Right to Farm Ordinance**

In recognition of the role of agriculture in the County, the Board of Supervisors has adopted a Right to Farm Ordinance (No. 1031). This ordinance requires a disclosure to owners and purchasers of property near agricultural lands or operations, or included in an area zoned for agricultural purposes. The disclosure advises persons that discomfort and inconvenience from machinery and aircraft noise resulting from conforming and accepted agricultural operations are a normal and necessary aspect of living in the agricultural areas of the County. The complete disclosure notice is contained in Appendix C.

If any residential or other noise sensitive land use is proposed within one-quarter mile (1,320 feet) of existing farmland which is in an agricultural zone, such proposed project shall be required to have prepared an acoustical analysis to evaluate potential noise impacts from farm operations on the proposed project. This may include an analysis of impact from operation of farm machinery or trucks hauling farm products on public roads.

## **4. Interior Noise Environment**

Where an acoustical analysis of a proposed project is required, the County shall identify and evaluate projects to ensure compliance to the California (Title 24) interior noise standards and the additional requirements of this Element. Prior to the issuance of a building permit, an acoustical analysis, or equivalent documentation, must be submitted that demonstrates compliance with the standard for all buildings to be located in an area of exterior noise level greater than 60 dB CNEL. No formal analysis may be required if the standard can be achieved by the minimum noise reduction indicated in Table 10 for the construction type proposed by the building permit or project.



**TABLE 10**  
**NOISE REDUCTION PROVIDED BY**  
**COMMON BUILDING CONSTRUCTION METHODS**

Construction Type	Typical Occupancy	General Description	Range <sup>1</sup> of Noise Reduction, dB(A)
1	Residential, Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Windows partially open.	15 - 20
2	Residential, Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Windows partially closed.	25 - 30
3	Commercial, Schools	Wood framing. Exterior stucco or wood sheathing. Interior drywall or plaster. Sliding glass windows. Fixed 1/4 inch plate glass windows.	30 - 35
4	Commercial	Steel or concrete framing. Curtain wall or masonry exterior wall. Fixed 1/4 inch plate glass windows.	30 - 40

<sup>1</sup> The range depends upon the openness of the windows, the degree of seal and the window area involved.

## 5. New Noise Generating Projects

The County shall identify and evaluate projects which have the potential to generate noise in excess of the Property Line Noise Limits specified in Table 9. An acoustical analysis must be submitted which demonstrates the project's compliance with the Property Line Noise Limits, and/or required mitigation measures to reduce noise to acceptable levels. Mitigation may include a greater property line setback than required by the Zoning Ordinance, use of solid building walls without openings, noise attenuation walls and/or landscaped earth berms, alternative construction materials or design, alternative traffic patterns, or other noise reduction techniques.

## 6. Projects Which Generate Off-Site Traffic Noise

The acoustical analysis shall identify and evaluate projects which will generate traffic and increase noise levels on off-site roadways. If the project has the potential to cause a significant noise impact to sensitive receptors along those roadways, the acoustical analysis report shall consider noise reduction measures to reduce the impact to a level less than significant, including reduction of the intensity of the proposed project, construction of noise attenuation walls and/or landscaped earth berms, or other changes in project design or its proposed access. For non-residential projects, reduced hours of operation may also be required.





## **7. Roadway Improvement and New Roadway Projects**

The County shall evaluate the noise impact potential of proposed roadway projects. Where noise impacts to sensitive receptors exceed the criteria specified above under "Significant Increase of Ambient Noise Levels", mitigation measures shall be included, where feasible, to reduce the increase to an acceptable level. If the mitigation cannot be expected to conform to the criteria specified under "Significant Increase of Ambient Noise Levels" and exceed the "Noise/Land Use Compatibility Guidelines" specified in Table 7, the proposed roadway project shall not be approved unless a "Statement of Overriding Considerations" is made by the project approval authority pursuant to the *State CEQA Guidelines*, Section 15093.

Federally funded projects shall comply with the applicable Federal Highway Administration (FHWA) standards.

## **8. Mitigation of Noise Impacts**

Where acoustical analysis indicates the potential for conflict with County noise standards or for significant noise impact, mitigation measures should be considered and incorporated into the project. Noise reduction measures may be applied at the source of the noise, along the path of the noise or at the receptor.

### **a. Noise Sources**

Modification of noise sources may not be feasible for many projects, especially where the source is transportation noise. The reduction of vehicle noise is usually the responsibility of federal and state agencies. However, on each analysis, reduction of noise at the source should be considered. If reduction at the source is possible, this is often the best solution for the noise environment. In transportation applications, the location of the source, or the frequency of operation may be modified in certain situations. For example, the designation of a truck route may move a source of vehicle noise to a less sensitive area; the reconfiguration of airport takeoff and landing patterns may change the impacts of the noise source.

In non-transportation applications, reduction of noise at the source may be possible in single source applications by a change in the nature of the source or the specification of the source. Gasoline engines are quieter than diesel engines; mufflers are available for many types of equipment; pumps, motors, and many types of equipment may be specified for maximum noise ratings.

### **b. The Noise Path**

Modification of the noise path is the most common method of noise reduction. Noise reduction measures may be applied near the source, in mid-path, or near the sensitive receptor(s). Path modification may be effected by increasing the direct distance between the source and receptor



or, more commonly, placing a barrier between the source and receiver. A noise barrier may be constructed solely for the purpose of noise reduction; a noise barrier may be comprised of other project elements. This latter type is discussed below in the sections related to site planning and architectural layout.

**Noise Barriers.** Noise barriers constructed exclusively for the purpose of noise reduction are most commonly used in connection with industrial noise sources and with ground transportation. The former case would include housings or buildings around pumps, motors, transformers and machinery. To reduce the impacts of ground transportation noise, walls or berms may be constructed along the rights-of-way of highways. Noise walls should be high enough to break the line of sight between the source and receptor; the wall should be long enough to prevent noise "flanking" around the end of the barrier; the wall should be thick enough to prevent significant noise transmission through the wall. To be effective, walls must be solid for the area of design. Even a small amount of opening will defeat the purpose of the wall.

The planning of a noise barrier must consider, in addition to acoustical requirements, aesthetics, safety and maintenance. Where a significant part of roadway noise comes from heavy trucks, as is the case in Imperial County, noise walls may have to be eight feet high to be effective, and visual impacts, as well as costs, may become paramount. Where feasible, earth berms may be used instead of walls, or a berm-wall combination. The advantages of earth berms are that a berm is more effective than a wall in noise reduction, and landscaping of a berm may improve aesthetics. The disadvantage of a berm is the additional ground area required. Where noise barriers are desired, and receptors do not want to lose a view, transparent walls, of glass or plastic, may be specified.

**Site Planning.** Consideration of noise impacts in site planning, using the shape and terrain of the site and the arrangement of project elements, can substantially reduce or eliminate adverse noise impacts. Site planning techniques for noise impact reduction include,

- Increasing the distance between the noise source and the sensitive receptor;
- Placing non-sensitive land uses, such as parking lots, open space, maintenance facilities and utility areas between the source and receptor;
- Using non-noise-sensitive structures, such as garages, to shield noise-sensitive areas;
- Orienting buildings to place the building as a shield between the source and the outdoor spaces of the building.

It should be noted that wide planted areas, such as parks or open space, provide greater noise attenuation than "hard" spaces, such as parking lots.





**Architectural Layout.** Noise reduction can be achieved by appropriate layout of the noise-sensitive spaces. For example, bedrooms will be quieter if placed on the side of the housing facing away from a roadway. U-shaped buildings can provide shielded, interior outdoor activity spaces. Noise-conscious architectural layout can often eliminate the need for costly construction modifications.

**c. Noise Receptors**

In most cases, the reduction of noise impact by some combination of source control and path modifications, as described above, is preferable to construction modifications at the receptor. In other cases, such as a single isolated receptor, construction modifications may be the most cost-effective solution to the noise problem. In general, the most effective modifications to reduce interior noise are made by reducing the area of windows, doors and other penetrations, such as ventilation intakes, exposed to the noise source and by making the windows, doors and other penetrations more resistant to noise transmission. Sealed windows, or well-sealing openable windows are efficient; mechanical ventilation must be provided for closed-windows conditions. Thicker window glass or double glazing may be appropriate. Solid doors and gaskets around door openings should be provided. In addition to door and window treatment, wall and roof insulation may be evaluated for noise reduction effectiveness.

**9. Noise Regulations**

The provisions of this Element applicable to activities where no discretionary application is required pursuant to the County Zoning Ordinance or Subdivision Ordinance, or a Specific Plan or General Plan Amendment is not involved, shall be implemented by an appropriate amendment to the Imperial County Code of Regulatory Ordinances. This shall include measures relative to "Property Line Noise Standards" and "Construction Noise Standards" specified above; and may include enforcement provisions and appropriate penalties for non-compliance.





## APPENDIX A

### GLOSSARY OF TERMS

**Acoustical Analysis Report:** A report required when a proposed project may result in excessive noise or a violation of County noise standards. The report would provide analysis of existing and proposed noise conditions in the project area, and mitigation measures to be incorporated into the project to eliminate or reduce noise impacts.

**Acoustics:** The science and technology of sound, including its production, transmission and effects.

**Ambient Noise:** All-encompassing noise associated with a given environment, being usually being a composite of sounds from many sources, near and far. No particular sound is dominant.

**A-weighted sound level:** The sound level obtained by the use of A-weighting, which is the numerical correction of sound levels measured by a sound level meter to correspond to the sensitivity of the human ear to various frequencies of sound. The unit of measurement is the decibel (dB); often the symbol is written dB(A) to indicate that A-weighting has been used.

**Community Noise Equivalent Level, CNEL:** The 24-hour equivalent continuous sound level, i.e., the time-averaged A-weighted sound levels, in decibels, from midnight, obtained after the addition of 5 dB to sound levels from 7:00 p.m. to 10:00 p.m. and 10 dB to sound levels from midnight to 7:00 a.m. and from 10:00 p.m. to midnight.

**Discretionary Project:** A designation used in the California Environmental Quality Act (CEQA) to describe a project which requires the exercise of judgment or deliberation when the public agency or body decides to approve or disapprove a particular activity. A project which is not a discretionary project is a ministerial project. In Imperial County, discretionary approval is required for specific plans, tentative maps, and subdivisions.

**Equivalent Continuous Sound Level,  $L_{eq}$ :** The level of a steady sound which, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.

**Frequency:** Of a periodic phenomenon, such as a sound wave; the number of times in one second that the phenomenon repeats itself. The unit of frequency is the hertz (hz), which corresponds to one cycle per second.

**Ministerial Project:** As defined in CEQA, a ministerial project describes a government decision involving little or no personal judgment by the public officials to the wisdom of carrying out the project. A ministerial decision involves the uses of fixed standards or objective measurements.



Examples of ministerial decisions are automobile registrations and marriage licenses. A building permit may be a ministerial decision if the ordinance requiring the permit limits the public official to determining if the zoning requirements have been met, the project meets the Uniform Building Code and the fees have been paid.

**Noise:** Unwanted sound.

**Noise level:** Sound level.

**Sound:** (1) An oscillation in pressure in an elastic medium which is capable of evoking the sensation of hearing. (2) The sensation of hearing excited by acoustic oscillation.

**Sound level:** The quantity, in decibels, measured by an instrument satisfying a standards requirement, e.g., the American National Standard Specification for Sound Level Meters S1.4. Mathematically, sound level in decibels is 20 times the logarithm to the base 10 of the ratio of a given sound pressure to the reference sound pressure of 20 micropascals.

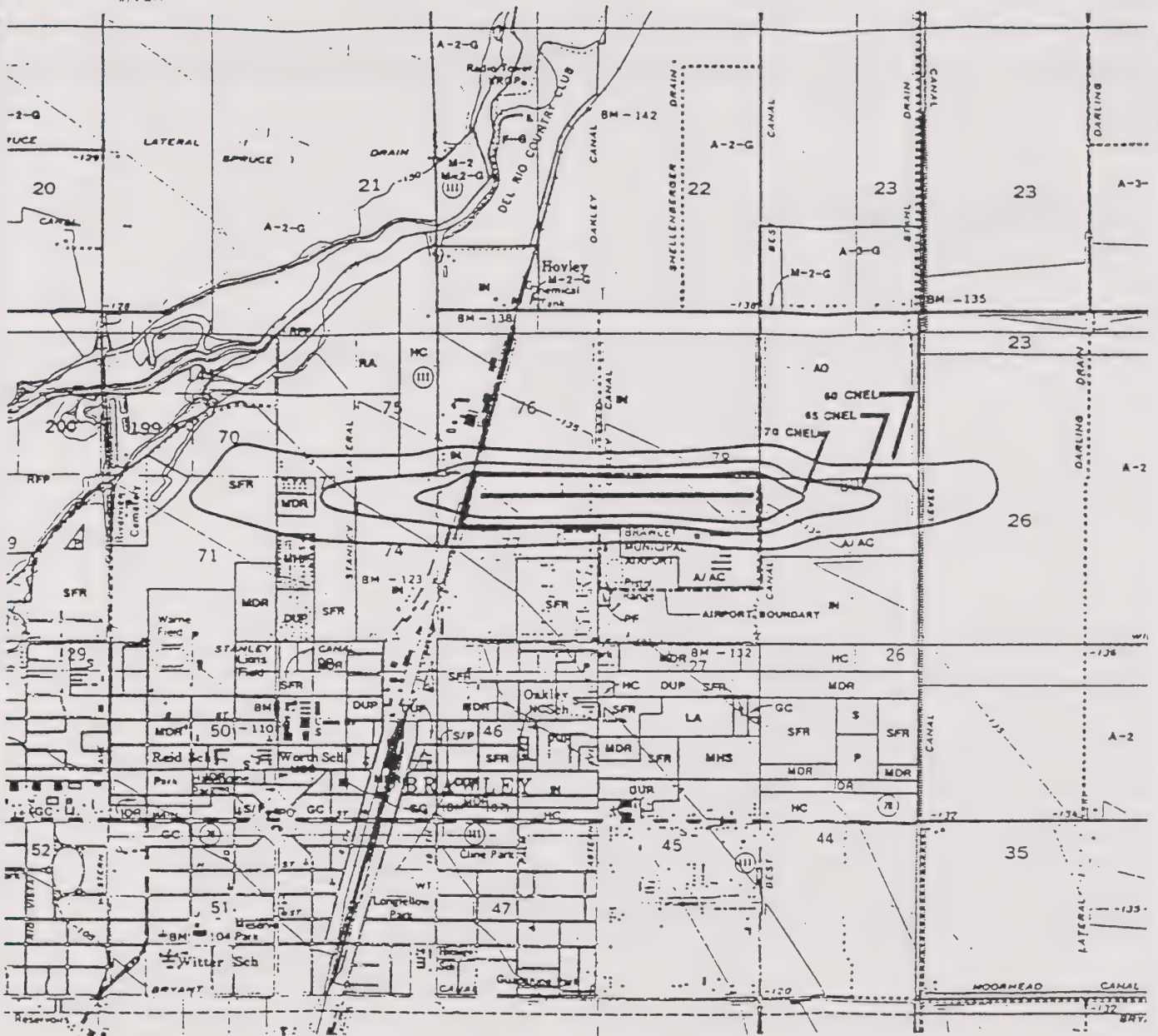




**APPENDIX B**

**AIRPORT NOISE CONTOUR MAPS**





SOURCE: June 91, Airport Land Use Compatibility Plan

NO SCALE



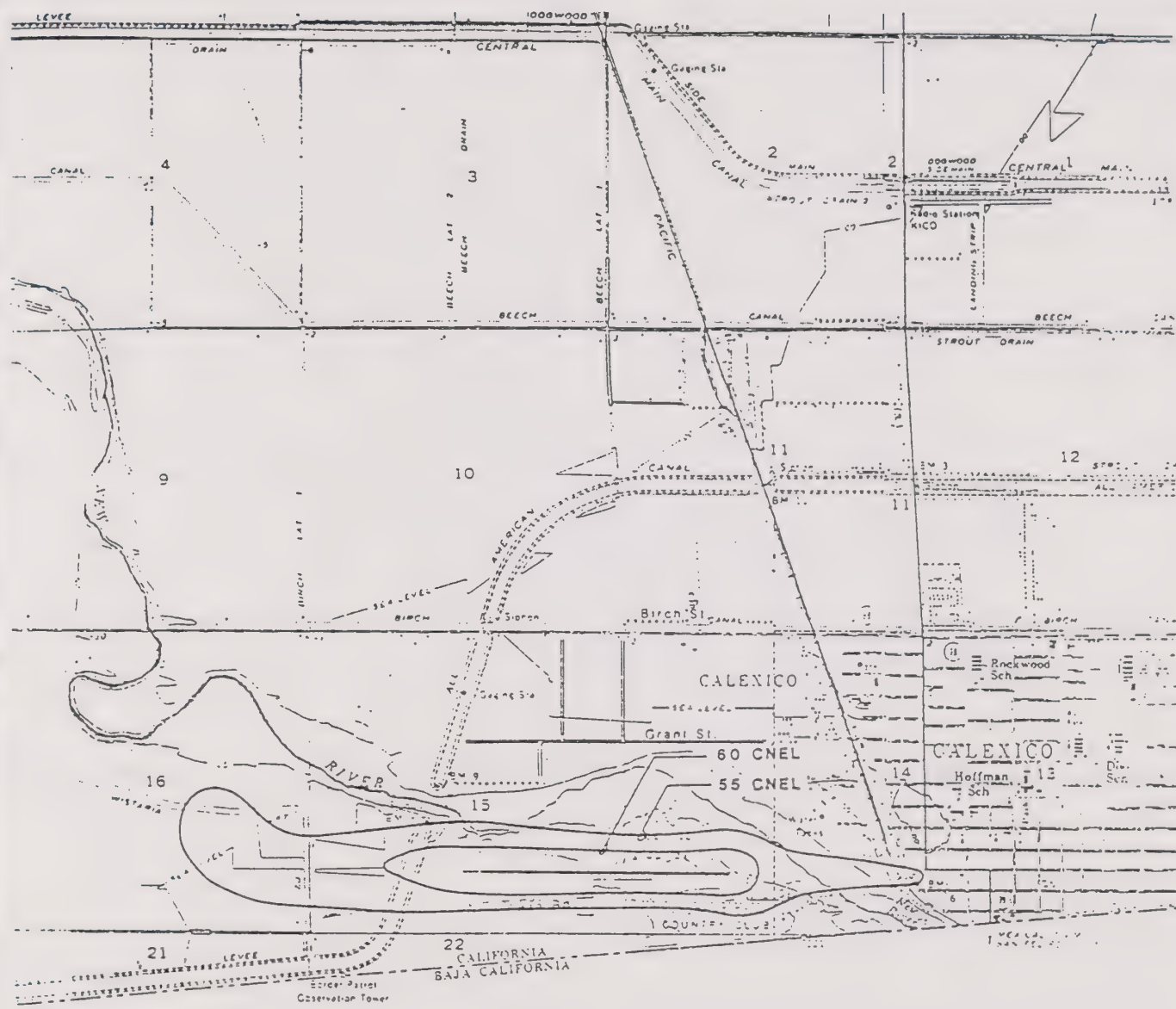
Imperial County  
General Plan

Future Noise Contours  
Brawley Municipal Airport

Noise Element

Figure  
B-1





SOURCE: June 91, Airport Land Use Compatibility Plan

0 1750' 3500'



Imperial County  
General Plan

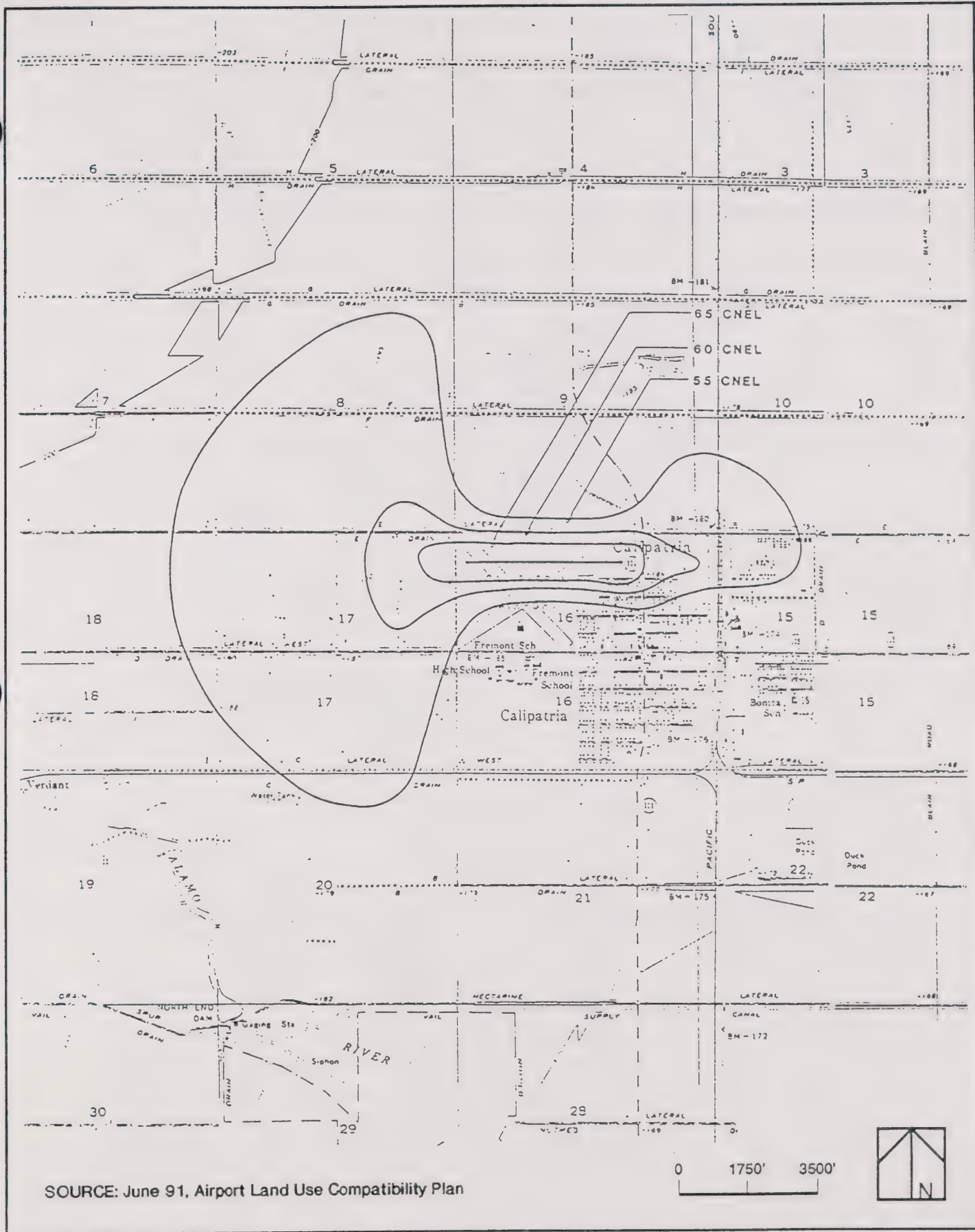
Future Noise Impact Area  
Calexico International Airport

Noise Element

Figure  
B-2







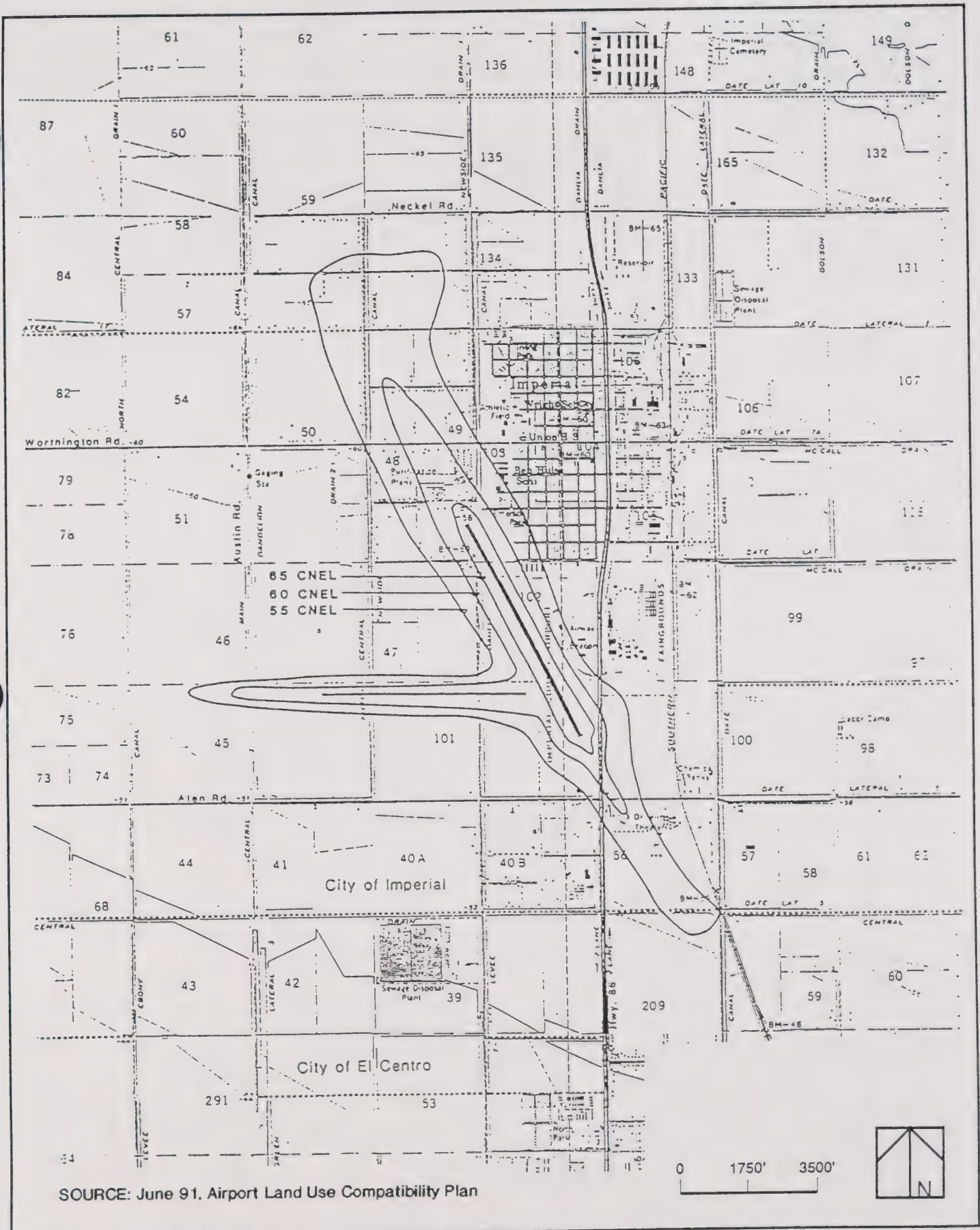
Imperial County  
General Plan

Future Noise Impact Area  
Calipatria Municipal Airport

Noise Element

Figure  
B-3





Imperial County  
General Plan





Future Noise Impact Area  
Imperial County Airport

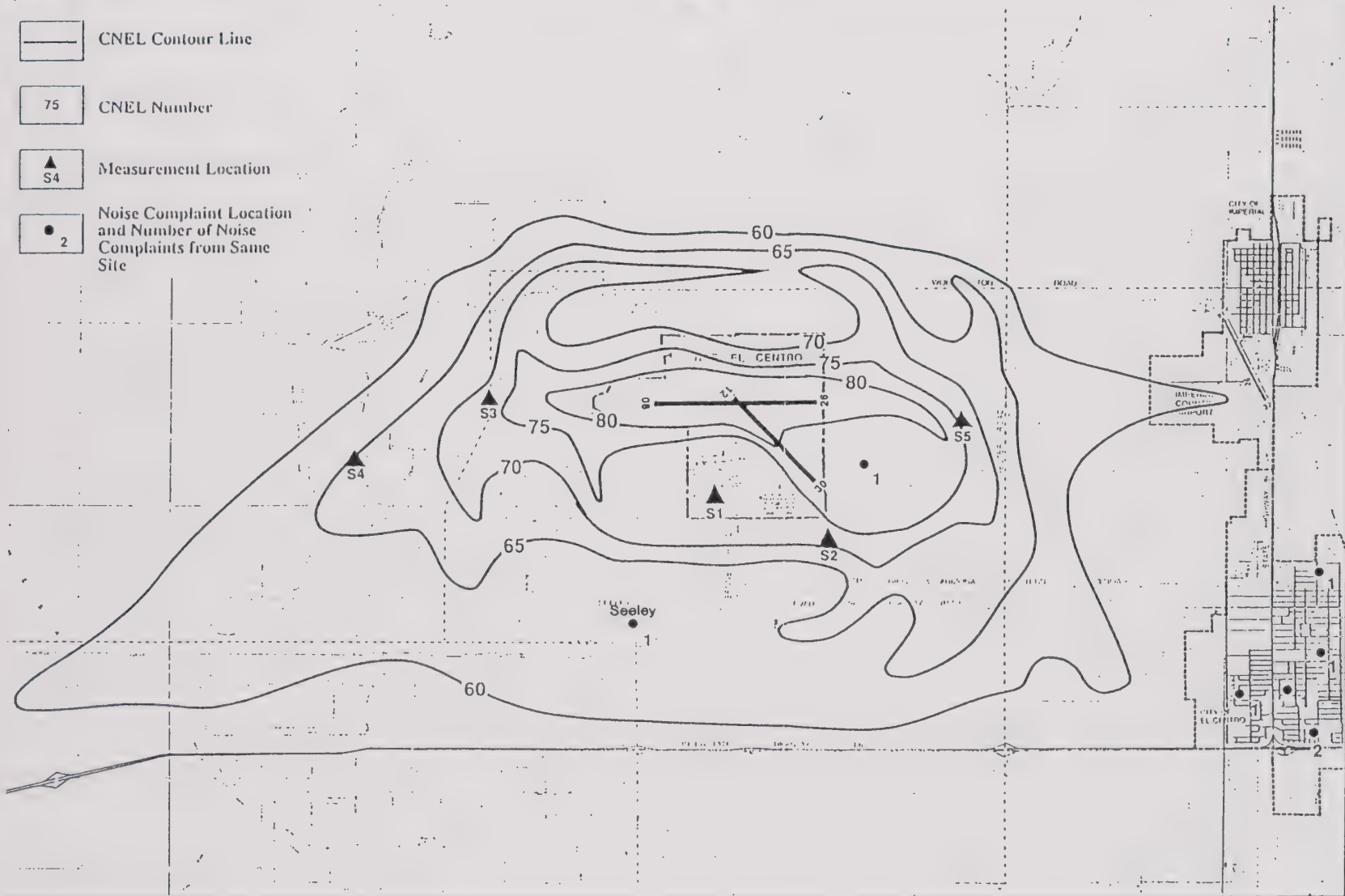
Noise Element

Figure  
B-4





-  CNEL Contour Line
-  75 CNEL Number
-  Measurement Location
-  Noise Complaint Location and Number of Noise Complaints from Same Site



SOURCE: June 91, Airport Land Use Compatibility Plan

0 1750' 3500'



Imperial County  
General Plan

Future Noise Impact Area  
NAF El Centro

Noise Element

Figure  
B-5





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seismic and public safety element

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## **IMPERIAL COUNTY GENERAL PLAN SEISMIC AND PUBLIC SAFETY ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

The County of Imperial is exposed to a wide variety of hazards that result from natural phenomena and human-induced accidents. These hazards can result in loss of life, bodily injury, and property damage. The County is bisected by active seismic faults that could generate dangerous earthquakes and other geologic activity. Although the County is located in a desert with very low precipitation, it is sometimes subject to heavy rains and subsequent flooding. Flooding could also result from damage to the All American Canal and associated transmission aqueducts. A few hazardous waste facilities are located in the County and accidents could dangerously pollute air and water.

The Seismic and Public Safety Element identifies potential natural and human-induced hazards and provides policy to avoid or minimize the risk associated with hazards. Potential hazards must be addressed in the land use planning process to avoid the unfolding of dangerous situations. For example, the risk associated with dangerous flooding can be avoided by not allowing development in floodplains and imposing strict safety standards on water transmission facilities.

A Safety Element is a mandatory element of the General Plan according to California Government Code Section 65302. This Seismic and Public Safety Element has been prepared to conform to the following requirement of the Government Code:

A safety element for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche, and dam failure; slope instability leading to mudslides and landslides, subsidence and other geologic hazards known to the legislative body; flooding; and wildland and urban fires. The safety element shall include mapping of known seismic and other geologic hazards. It shall also address evacuation routes, peakload water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.

#### **B. Purpose of the Seismic and Public Safety Element**

The purpose of the Seismic and Public Safety Element is directly concerned with reducing the loss of life, injury, and property damage that might result from a disaster or accident. This Element identifies goals and policies that will minimize the risks associated with natural and human-made hazards. In addition, the Element specifies land use planning procedures that should be implemented to avoid hazardous situations.





### C. Risk Assessment

Risk assessment refers to the subjective process of comparing the cost to avoid or reduce a hazard with the cost of the potential damage produced by the hazard. The concepts "acceptable risk" and "avoidable risk" are important in risk assessment. An avoidable risk refers to situations where the risk of a potential hazard can be entirely reduced by circumventing the development of the potential hazard. An example of an avoidable risk is the preclusion of residential development in floodplains. Avoiding the risk, however, can involve costs which are measured by time, money, inconvenience, and inefficiency. Under these circumstances, the reduction in risk must be weighed against costs. An acceptable risk refers to the point where an incremental reduction in risk does not justify increased cost. An example of an acceptable risk is the development of a gravel mining operation in a floodplain that possesses large gravel reserves. While there is a risk of flooding, locating a gravel mining operation outside of the floodplain would be inefficient and economically infeasible.

In establishing guidelines for acceptable risk, the County makes distinctions between hazards resulting in personal injury or loss of life, hazards resulting in disruption of essential services, and hazards resulting in damage to structures and property. The risks of personal injury, loss of life, and the disruption of lifelines are unacceptable but the risk of structural damage is acceptable. The County will impose restrictions or conditions on development to avoid personal injury, loss of life, and lifeline disruption and reduce the threat of structural damage.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Geologic Activity**

Earthquakes are the principal geologic activity affecting public safety in Imperial County. They are a triggering event which permit the force of gravity to operate and create many secondary hazards from ground shaking, including: (1) differential ground settlement, soil liquefaction, rock and mudslides, ground lurching, and avalanches; (2) ground displacement along the fault; (3) floods from dam and levee failure, and seiches; (4) fires; and (5) the various adverse results of disruption of essential facilities and systems - water, sewer, gas, electricity, transportation, and communication (and notably in Imperial Valley, the irrigation and drainage system). This section will focus on earthquakes and other geologic activities; flooding, fires, and disruption of essential services, whether seismically induced or otherwise, will be discussed separately.

#### **1. Earthquakes**

Earthquakes, are the result of an abrupt release of energy stored in the earth. This energy is generated from the forces which cause the continents to change their relative position on the earth's surface, a process called "plate tectonics." The earth's outer shell is composed of a number of relatively rigid plates which move slowly over the comparatively fluid molten layer below. The boundaries between plates are where the more active geologic processes take place. Earthquakes are an incidental product of these processes.

California rests on the boundary between the North American Plate and the Pacific Plate. The San Andreas Fault system is located where the northwesterly drifting Pacific Plate grinds along and is subducted by the southwesterly drifting North American Plate. Baja, and California west of the fault system, are part of the Pacific Plate and move northwest compared to the rest of California and North America.

The Imperial Valley is a broad, flat, alluviated area that lies partly below sea level, cut off from the Gulf of California to the south by the Colorado River Delta. The valley, also known as the Salton Trough, is one of the most tectonically active regions in the United States. The eastern boundary is formed by branches of the San Andreas fault and the western boundary is formed by the San Jacinto-Coyote Creek and the Elsinore-Laguna Salada Faults. Consequently, the Valley is subject to potentially destructive and devastating earthquakes. Figure 1 shows the general location of known or inferred major fault lines in Imperial County.

More small to moderate earthquakes have occurred in the Imperial Valley area than along any other section of the San Andreas Fault system. During the current century, the area has experienced eleven earthquakes of magnitude 6.0 or greater on the Richter scale with the strongest being a magnitude of 7.1 on the Imperial Fault in 1940. The deep, sediment-filled





Imperial County  
General Plan

Seismic Activity in Imperial County

Seismic and Public Safety Element

Figure  
1





geologic structure of the Imperial Valley makes the area particularly susceptible to severe earthquake damage. The Cities of Brawley, Imperial, El Centro, and Calexico have experienced damage from the movements of major faults in the San Jacinto fault zone, which includes the Imperial and Superstition Hills Faults.

A moderate to severe incident with intense ground shaking in the populated areas of Imperial County could reasonably be expected to cause numerous casualties, extensive property damage, fire, road closures, disruption of rail systems, communication systems (particularly telephone systems), the County's extensive canal system, and utilities. In addition, health hazards would be posed by damaged sewer systems, waste treatment facilities, and the possible contamination of the County's potable water supply. Medical treatment facilities would most likely be overtaxed. Theft and looting may also be a problem. The resultant disruption of the agricultural community would affect the local economy.

In accordance with the Alquist - Priolo Special Studies Zone Act (Chapter 7.5, Division 2, Public Resources Code, State of California, effective May 4, 1975) the Office of State Geologist delineated Special Study Zones which encompass potentially and recently active traces of four major faults (San Andreas, Calaveras, Hayward and San Jacinto). These Special Study Zone Maps depicting active fault traces are available for public review at the Imperial County Planning Department and the Imperial County Public Works Department. The Alquist - Priolo Special Study Zone Act is enforced by the County to assure that homes, offices, hospitals, public buildings, and other structures for human occupancy which are built on or near active faults, or if built within special study areas, are designed and constructed in compliance with the County of Imperial Codified Ordinance.

It is difficult to predict the severity of casualties and property damage that could result from an earthquake. The severity of casualties and property damage depend on the intensity of the earthquake, location of the epicenter to populated areas, and the time of day of the occurrence. The analysis of past earthquakes provides some useful information regarding the potential consequences of future severe earthquakes. Appendix A provides a summary of earthquakes that have impacted the County between 1852 and 1988.

The 1940 earthquake along the Imperial Fault registered a 7.1 on the Richter scale. The epicenter was located east of El Centro. The ground was ruptured for forty miles from Volcano Lake in Baja California to a point near the City of Imperial. Seven deaths occurred and property loss was in excess of \$5 million. Eighty percent of the buildings in Imperial were destroyed; fifty percent of Brawley's structures were damaged. Indirect damage to crops was substantial due to the subsequent disruption of drainage and flooding. Horizontal displacement across the completed but unfilled International Canal was 14 feet, 10 inches and the U.S.-Mexico boundary was permanently changed. The Alamo Canal in Baja California was also offset and a local flood resulted from water spilling out of the broken channel.



Perhaps the most conspicuous area of surface rupture was on State Highway 98 eight miles east of Calexico. The roadway was broken by a four-foot scarp, and rows of trees in an orange grove south of the highway and west of the Alamo River bridge were offset almost 10 feet. The maximum horizontal displacements of the earthquake, which were approximately 29 feet, were measured in the area just south of the orange grove.

Existing information about earthquakes that have occurred in Imperial Valley suggest that an equal number of earthquakes of equal intensity may occur within the future. The County can expect injuries, casualties and property damage from earthquakes as some time in the future because of the past frequency of moderately high magnitude and intensity earthquakes; the distribution of active faults and epicenters; and the projected increase in population.

## **2. Landslides**

A landslide refers to slowly to very rapidly descending rock or debris caused by the pull of gravity. Landslides affect humans in many ways. A very rapid landslide could result in casualties and devastating property damage while a slow landslide could result in the nuisance of having a fence slowly pulled apart. The cost in lives and property from landslides is surprisingly high. According to the U.S. Geological Survey, more people in the United States died from landslides during the last three months of 1985 than were killed by all other geologic hazards, such as earthquakes and volcanic eruptions. The damage to property from landslides each year exceeds the cost of earthquake damage for the last twenty years.

The process of grading can accelerate landslide activity. Slope and material failure often results from failing to utilize precautionary measures to stabilize slopes or cutting into the failure plane of an existing landslide. In California, landslides are a common problem in the hillside areas and particularly in developed hillside areas that required grading.

The potential for landslides in Imperial County is low to moderate along the western edge of the County parallel to the Coast Range Mountains. Additional areas in the County subject to landslides include the irrigated valley between the East Highline and Westside Main canals and bluffs adjacent to the All American Canal, Coachella Canal, New River, Alamo River, and the Colorado River. The hazardous landslide areas adjacent to these water courses are defined as:

1. A distance of fifty feet outside of the shaded flood zone areas delineated on the Federal Emergency Management Agency (FEMA) maps for the New and Alamo Rivers; and
2. A distance of one-half the canal bank height beyond the toe of the slope for all of the levee and canal banks.

Figure 2 illustrates the distribution of landslide activity in the County.





Seismic and Public Safety Element



### 3. Subsidence

Subsidence is the gradual, local settling or sinking of the earth's surface with little or no horizontal motion. Subsidence is usually the result of gas, oil, or water extraction, hydrocompaction, or peat oxidation, and not the result of a landslide or slope failure. Ground surface effects related to subsidence are generally restricted to long surface structures such as canals, drains, and sewers, which are sensitive to slight changes in elevation.

Subsidence from earthquakes and other activities, including geothermal resources development, can disrupt drainage systems and cause localized flooding. Agricultural operations within the County depend on gravity-fed irrigation, drainage, and tiling systems. These systems utilize existing land contours and have little tolerance for change. Areas away from the irrigated fields, canals, and drains may be less sensitive to land surface elevation change.

It is also to be noted that the "Valley", within the County, experiences a continuous natural subsidence toward the Salton Sea. Natural subsidence has been occurring within the Salton Trough, averaging nearly two inches per year at the center of the Salton Sea and it decreases to zero near the Mexican border. It is generally uniform, but local depressions have formed such as the Mesquite Sink located along Highway 86 between Imperial and Brawley. Earthquakes have caused abrupt elevation changes in excess of one foot across fault lines.

Increases in development of geothermal resources could be a factor for the future. Recent reports by the geothermal industry in the Heber area indicates that some subsidence has occurred over several years and could be expected to change further depending on the rate and volume of extraction/injection.

Well field programs covering production and injection plans are required by the Bureau of Land Management and the Division of Oil and Gas for each major geothermal project. Detrimental subsidence from geothermal development needs to be avoided through careful permit review by CDOG and the County, establishment of standards for each project, and through impact mitigation and monitoring programs.

### 4. Erosion

Erosion is the removal of rock fragments or soil by the action of running water, glacial ice, or wind. Human activities can accelerate erosion. The areas in Imperial County that are most subject to erosion are the Algodones Sand Dunes paralleling the East Mesa and Superstition Mountain, and the Chocolate, Picacho, Cargo Muchacho, and Coast Range Mountains. The remainder of Imperial County is generally flat and experiences low levels of natural erosion. Figure 3 illustrates the erosion activity throughout the County.











## **5. Soil Stability**

The geologically young, unconsolidated sediments of the Salton Trough are subject to failure during earthquakes, especially throughout the irrigation portion of the Valley where the soil is generally saturated. Liquefaction, and related loss of foundation support, is a common hazard.

### **B. Flooding**

Flooding is a natural hazard present in Imperial County due to the County's geography, geology and climate. There are various facets to flooding; all of which are relevant to Imperial County. Flood hazards include the following: natural floodplains, seiches, and dam failure.

#### **1. Natural Floodplains**

The entire county is subject to various degrees of flooding in the form of flash floods or slow floods caused by heavy precipitation. Flash flooding is not infrequent in desert areas. Such flooding occurs when sudden downpours over the mountains and/or desert tend to create instantaneous peak flows which roughly follow empty stream beds and mountain washes.

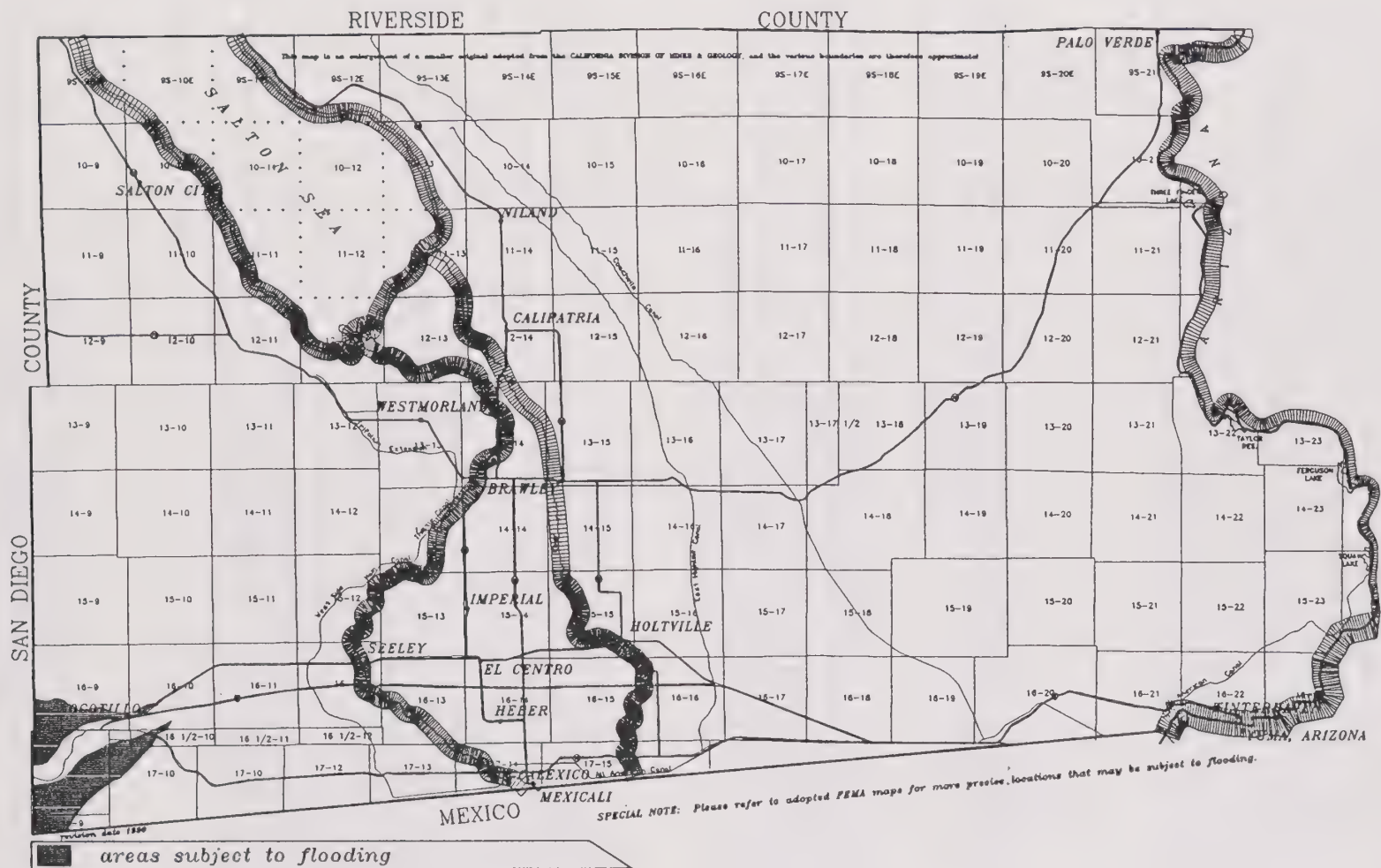
Flooding can occur either in floodplains or floodways. Floodplains are generally located adjacent to rivers and other bodies of water, and in low lying areas near a water source. The external boundary of floodplains is defined by the predicted extent of inundation that would result from the most intense storm that occurs once every one hundred years. Floodways are defined by discernible drainage channels. Floodways are more hazardous due to the anticipated velocities of the flood waters and expected damage to life and property. Such designations occur along the Myer Creek (through Ocotillo) and within the levees along the Colorado River. Further information can be obtained by consulting the Flood Insurance Rate Maps (FIRM's) prepared by the Federal Emergency Management Agency, which are on file with the County Department of Planning. Figure 4 illustrates the areas in the County that are particularly at risk to flood hazards.

Within the County jurisdiction, the communities of Bombay Beach and Ocotillo are considered to be the most likely to experience significant flooding. In El Centro, the Gillett/Cannon Roads area receives the heaviest flooding. It is at a low elevation east of El Centro and south of East Evan Hewes Highway.

Bombay Beach is located in a pocket created by the Salton Sea on the west and the Chocolate Mountains on the east. Severe flooding could isolate the community. In the event of a major flood, approximately 300 to 1,000 residents would have to be evacuated.

The communities of Ocotillo and Nomirage are at risk due to their location at the base of an alluvial fan originating at the base of Myer Creek. More specifically, Myer Creek is located in the southwestern part of Imperial County and flows in a northeasterly direction through the townsites of Ocotillo and Nomirage, draining over 21.8 square miles.





SOURCE: Federal Emergency Management Agency

Imperial County  
General Plan

Flood Areas

Seismic and Public Safety Element

Figure  
4





Flood plain management is the key component to effective flood control within Imperial County. The Federal Insurance Administration delineates areas of special flood hazards, the risk premium zones, and floodways through official maps: Flood Insurance Rate Map (F.I.R.M.); and Flood Boundary and Floodway Map. These maps form the basis for Imperial County's Flood Ordinance which is intended to be applied to those areas which are subject to periodic flooding and accompanying hazards. These official maps show all canals, drains, and rivers, and at 1"-1000' are a useful reference map. Most of the irrigated valley is designated zone "C" - indefinite minor flooding - reflecting the flat terrain and the canal system. Official Flood Insurance Rate Maps (F.I.R.M.) are available for public use at the Planning Department of Imperial County.

## **2. Seiches**

A seiche is a to and from vibration of a body of water like the slopping of water in a jolted basin. Once initiated, the water body continues to oscillate independently. Seiches can be triggered by seismic events such as earthquakes.

The most likely location for a significant seiche to occur is the Salton Sea. While there have been a number of seismic events since the formation of the Salton Sea, no significant seiches have occurred to date. A seiche could occur, however, in the Salton Sea under the appropriate seismic conditions. The Salton Sea is proximal to the San Andreas and San Jacinto faults and would be subject to significant seismic ground shaking that could generate a seiche.

## **3. Dam Failure**

Flooding, due to dam failure, is a factor which could seriously affect eastern Imperial County. The California Office of Emergency Services is charged with keeping on file the "inundation map" and "dam failure response plan" for each dam in the state. The dam owner/operator is, however, responsible for map and plan preparation. These documents generally do not exist. Imperial Dam, the only significant dam in Imperial County, has a plan, but no map; Laguna Dam has no plan, but the map is under preparation; Senator Wash Dam has no plan or map; and the Parker Dam has a plan, but no map. Failure of any of these dams would certainly cause inundation of the down stream shorelines, all of the Bard - Winterhaven area, and possibly would flush large quantities of water through Mexico into the New and Alamo Rivers. Inundation of the community, however, is considered unlikely; hazard analysis suggests that dam failure would likely occur only if heavy precipitation was coupled with significant seismic activity near the dam. Flooding through Mexico would most probably be confined to the already designated flood areas.

## **C. Fire**

The potential for a major fire in the unincorporated areas of the County is generally low. Fire hazards exist, however, at two different sites in the County at the fuel storage farms located south of the City of Imperial and east of Niland. In the event of a fire, assistance from various



fire departments within the County would be required. The threat of fire spreading and causing major problems to other areas of the County are minimal due to the isolated locations of the fuel storage farms.

The most significant regulatory codes from the standpoint of fire safety are fire prevention and building codes. The County implements the Uniform Building Code (UBC) and the Uniform Fire Code (UFC). These uniform codes are intended to serve only as minimum standards. Therefore, it is important that these minimum fire safety standards be strictly enforced by fire and building agencies in the unincorporated County.

The Imperial County Codified Zoning Ordinance also contains provisions which act to reduce fire hazards. The Zoning Ordinance is a tool that helps prevent the construction of incompatible or hazardous structures. For example, the ordinance separates industrial, commercial and residential uses and provides for the isolation of land uses that may create excessive fire exposure to other properties. It also limits the height and bulk of buildings, specifies setbacks and distances between buildings.

The Imperial County Subdivision Ordinance is also used to reduce the risk of fire by securing, as a condition of subdivision of land, water systems of adequate size and pressure for fire fighting, and adequate roadway widths for emergency service vehicle access including maneuverability of fire trucks. As part of the review process, the Imperial County Planning Department seeks recommendations from fire and water districts wherever the proposed subdivision is located.

The County of Imperial Fire Prevention and Explosives Ordinance, Section 53101-53300, contains provisions for the purpose of prescribing regulations governing conditions hazardous to life and property from fire or explosion. Such measures in this Ordinance include the following:

- Storage of flammable materials
- Storage of Radioactive materials
- Permit required for sale and use of fireworks
- Abatement of weeds and other vegetation

The Fire Prevention Education Program encompasses a public information and education component that promotes public awareness of the significance of Fire/Safety prevention measures. This program enables the public to be better prepared when an emergency fire situation occurs.

#### **D. Hazardous Material Accident**

A hazardous material accident could occur in Imperial County due to the agricultural economy, proliferation of fuel tanks and transmission facilities, intricate canal system, and the confluence of major surface arteries and rail systems. Although a hazardous material accident can occur





almost anywhere, particular regions are more vulnerable. The potential for an accident is increased in regions near roadways that are frequently used for transporting hazardous material, and in regions with agricultural or industrial facilities that use, store, handle, or dispose of hazardous material.

The release of hazardous material into the environment could cause a multitude of problems. The release of explosive and highly flammable materials have caused fatalities and injuries, required large-scale evacuations, and destroyed millions of dollars worth of property. Toxic chemicals in gaseous form have caused injuries and fatalities among emergency response teams and passerby. Serious health problems have occurred where toxins have entered either surface or groundwater supplies. Serious health problems have occurred. Releases of hazardous chemicals have been especially damaging when they have occurred in highly populated areas, or along heavily traveled transportation routes. The degree of threat posed to life and property is dependent on the type, location, and concentration of the material released, in addition to prevailing weather conditions such as precipitation, wind speed, and wind direction. Appendix B contains a summary of hazardous material storage sites, handlers, and vendors.

The Laidlaw Environmental Services hazardous waste facility located west of Westmorland is unique in the sense that a major wash traverses the site. Substantial engineering design was utilized to minimize flooding, and channel maintenance requirements have been implemented. While the facility does pose a potential risk, the continued monitoring and stringent design standards imposed on the facility have minimized the probability of a serious failure. Special reports on design requirements and risk concerns are on file at the Planning Department.

A second type of facility which is more predominant and more difficult to assess. These facilities are the chemical handling and storage facilities and include distributors, transporters, and crop dusting firms. These firms are not permitted to store the various chemicals in open areas, or in buildings not adequately protected from flood conditions. During severe flooding the potential for these chemicals to be mixed with the flood water can pose a potentially serious health concern.

Pursuant to Section 25500 et seq. of the California Health and Safety Code, the County Health Services Department is designated as the "administering agency" responsible for maintaining a list of handlers/vendors of toxics within the County. In addition, they are required to maintain, for each handler/vendor, to maintain an inventory and business plan. This information is also available to the County Fire Marshal and city fire departments. The "Imperial County Emergency Plan" (1988) lists the ten largest concentrations of toxics in the County, which are shown on Figure 5 and are: (1) Naval Air Facility El Centro; (2) Santa Fe Pacific Pipe Line Tank Farm; (3) ST Services; (4) 89.92 miles of fuel pipelines; (5) Brea Agricultural Service; (6) United Agriculture Products; (7) Puregro Company; (8) Rockwood Chemical Company; (9) Helena Chemical Products; and (10) Wilbur Ellis Company.





## E. Lifelines and Critical Facilities

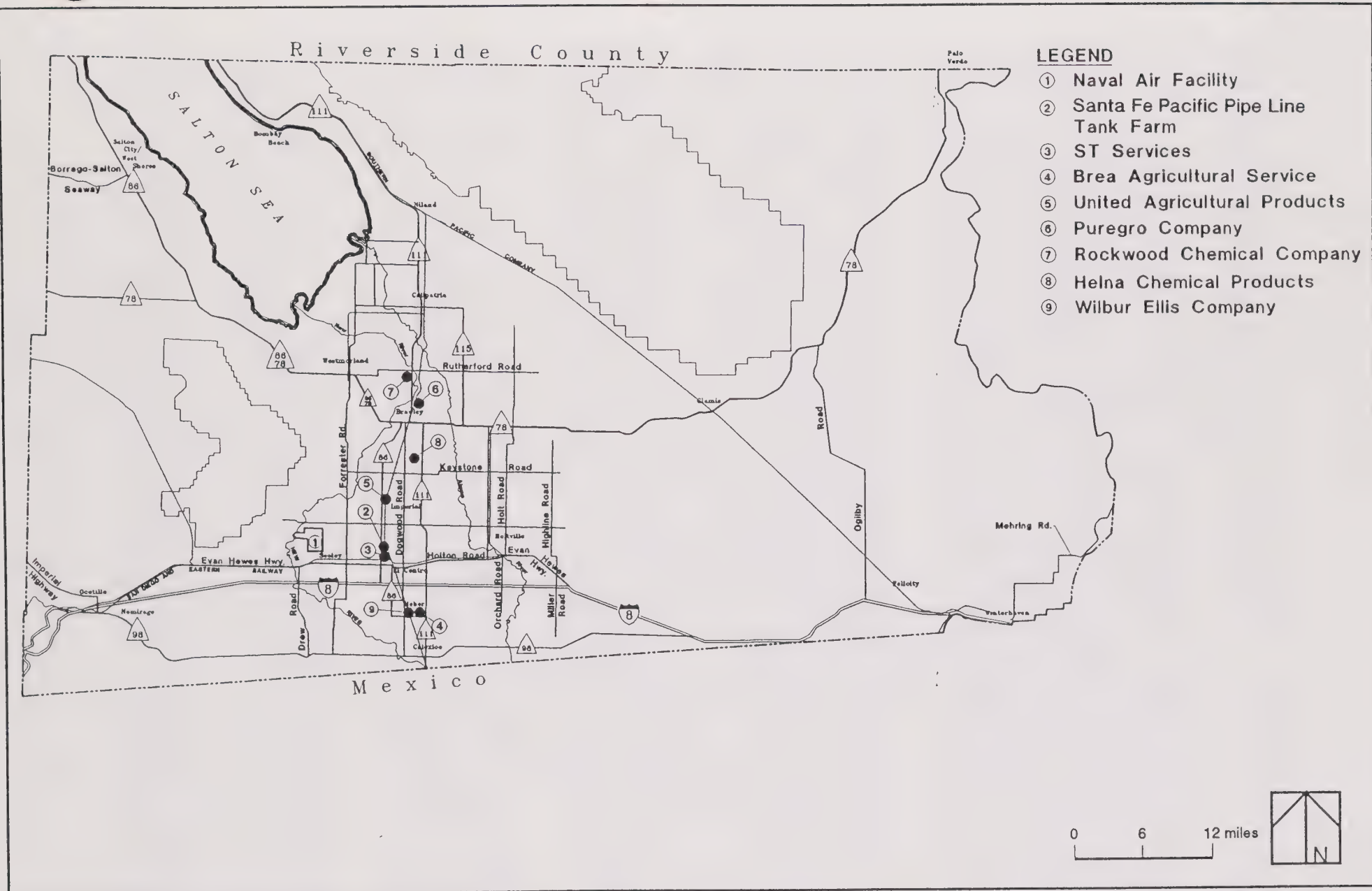
The disruption of lifelines and critical facilities can endanger the safety of the public. Lifelines refer to networks of services that extend over a wide area and are vital to the public welfare. Lifelines typically involve supply sources, transmission lines, storage facilities, and distribution systems. Damage to any one of these key elements might cause loss of service to large areas or the entire service area. Lifelines can be classified into four categories: Energy, Water Transportation, and Communication. These categories circumscribe the lifelines indicated in Table 1.

TABLE 1 SUMMARY OF LIFELINES				
	Energy	Water	Transportation	Communications
Type of Lifelines	Electricity Liquid Fuel Gas	Potable Water Sewage Solid Waste	Highway Railway Airport Harbor	Telephone Telegraph Radio Television Mail Press

Energy. Electricity is provided to the vast majority of Imperial County and the Coachella Valley area of Riverside County by the IID. The transmission and distribution system is moderately resistant to earthquakes. When parallel overhead power lines have too much slack or sag unevenly, they may come in contact with one another during an earthquake. The resulting arcing could cause conductors to burn and fall to the ground. On the other hand, if overhead powerlines are too taut, they could snap and fall to the ground from earthquake shaking. Overhead powerlines can also be broken by objects jostled from earthquake shaking, (e.g., trees, antennas). The entire electrical distribution system is protected by relays designed to prevent current overload. Seismic vibrations themselves can cause the relays to "trip" and cut off power. Such an abrupt power disruption could cause current overloads in other parts of the system. As a result, other relays could trip and cut off more power. Although the risk of serious damage to the distribution system is low, the risk of partial or total loss of power is fairly high.

The IID's generating facilities and sources of power are varied and dispersed across the County. The probability is low for all of the facilities being disrupted simultaneously. The main generating facilities are El Centro (180 megawatts), Brawley (18 megawatts), Rockwood (50 megawatts), and Coachella (80 megawatts). Hydroelectric facilities along the All American Canal have a maximum capacity of 45 megawatts. All of these facilities are located in seismically active zones. The facilities are also located within 15 miles of each other with the





Imperial County  
General Plan

Hazardous Material Sites

Figure  
5

Seismic and Public Safety Element





exception of the Coachella plant and the hydroelectric facilities. The probability of all of the plants being disrupted during a seismic event is considered low. A break in the All American Canal could also reduce electricity generation.

Liquid petroleum products are delivered to and are transported through the County via the twenty-inch Santa Fe Pacific Pipe Line. This line is generally located within the Southern Pacific Railroad right-of-way. The right-of-way follows the northwest to southeast trend of Imperial Valley and subsequently parallels the major faults. It passes near the east side of the Salton Sea and serves the storage facility at Niland. Southeast of Obilby, the line turns east and travels to Yuma. A six-inch branch line distributes gas to the storage facility south of Imperial and a four-inch line serves the Naval Air Facility near Seeley. The maintenance staff for the line anticipates no special problems from earthquakes or fault movement and are unaware of such a situation occurring in California in past years. A major break would take one to two days to repair.

The petroleum storage facilities in Niland and Imperial are vulnerable to earthquakes. Storage capacity at Niland is 77,500 barrels and at Imperial is 289,000 barrels. Storage tanks, however, are never full at one time but are normally filled fifty percent. The 1979 earthquake resulted in the rupture of one tank and a gasoline leak of 100 gallon per minute at the Imperial facility. The potential for a major disaster does exist. The probability of loss of all liquid petroleum in the County is low. Emergency service via tanker is readily available if required during an emergency situation.

Natural gas is delivered by the Southern California Gas Company via twin ten-inch lines which generally run south through the County in Range 14 East. These lines serve Niland, Calipatria, Brawley, Imperial, El Centro, Heber, and Calexico and branch lines serve Holtville, Westmorland, Seeley, NAF, and Plaster City. Rural residents are served by laterals from the branch lines. The lateral lines typically do not exceed a quarter mile in length.

The gas lines are less resilient to seismic stress than the liquid lines and the entire natural gas system is vulnerable to disruption. The lines were damaged from the 1979 earthquake. The north-south line was damaged in the area it crossed the fault. The line suffered compressive stress and a fitting buckled and resulted in a major leak. The leak was repaired without shutting down the line. The line to Holtville was stretched where it crossed the fault. The line did not break and was repaired without shutting down the line.

The natural gas network is much more extensive than the liquid petroleum system. Leaks are more insidious. The risk of an explosion or fire is greater. The most serious potential hazards are at the customer service connections. Gas connections to hot water heaters are notably vulnerable to seismic shaking.

The biggest potential problem would result from damage that required shutting the natural gas delivery system down. A major rupture of the ten-inch line would be difficult to repair. Once pressure was lost and air entered the system, a total shut down would be required. Service



personnel would have to visit the customer connections at each twice. The initial visit would be require to insure that the gas was turned off. The second visit would be required to turn the gas back on, bleed the air, and assist in relighting fixtures. This would be a massive job that would take weeks. The main purpose of the twin lines is to avoid this type of disaster.

Water and Sewer. About seventy percent of the population is provided potable water for domestic purposes from municipal water systems, which are primarily served by the Imperial Irrigation District (IID). Rural residents obtain potable water from truck delivery companies, such as the AAA Company, or from individual wells. IID operates 1700 miles of canals; and the Coachella Irrigation District operates 83 miles of canals that traverse the County. The entire system is vulnerable to disruption by earthquakes. Approximately half of the system could generate flooding from a break. IID has adopted the Disaster Readiness Standard Operating Procedure to respond to earthquakes and other emergencies.

A number of the communities in the County are provided sewer service by municipal districts. Earthquakes can rupture line and affect lift station operations. These problems are not considered serious. Unless the seismic event totally disables the treatment plant, sewage can be transported using alternative means such as portable pumps and lines. In the event of a complete plant failure, temporary evaporation ponds could be utilized for the interim repair period.

Transportation. The County is well served by a variety of transportation routes which are unlikely to be so extensively damaged by a natural disaster as to endanger the public safety due to disruption of lifelines. Interstate 8 to San Diego County is potentially the most critical because it goes through mountainous terrain. No other convenient surface route to the metropolitan San Diego area exists. The Southern Pacific Railroad line along the east side of the Salton Sea is also endangered by its proximity to the San Andreas Fault. Severe damage to either of these facilities is likely to significantly impact local and interstate commerce, but not substantially threaten public safety.

Communications. The telephone system in the County is the most elaborate communication network in the country. The equipment and facilities can withstand earthquakes up to 8.0 on the Richter scale. An Emergency Preparedness Plan has been developed by the telephone company. The telephone network is designed to service sixty percent of the customers requesting dial tone.

The telephone system was not damaged by the 1979 earthquake, but was overloaded with attempted phone calls within minutes of the earthquake and remained essentially inoperative for up to 18 hours in parts of the County. There is a high probability that the telephone system would be significantly dysfunctional following a major earthquake. The Countywide Communication Plan was adopted in 1980 and provides direction for communication via the various radio networks when there are no telephone capabilities. Due to problems with the telephone system immediately after the 1979 earthquake, the IID installed its own in-house telephone system that utilizes a microwave system. The microwave towers have been designed to withstand the most severe earthquake.





Critical Facilities. This refers to site specific facilities that serve to maintain the health, safety, and general welfare of the public. Critical facilities can serve the public under normal circumstances (e.g., hospitals, fire stations, water reservoirs, and power plants) or under emergency circumstances (e.g., emergency operating centers, armories, or disaster supply warehouses). The "Imperial County Emergency Plan" provides specific details on functional, organizational, and operational concepts and procedures for the provision of critical services during an emergency. This includes overall management of emergency operations, fire and rescue, law enforcement and traffic control, medical, public health, coroner, care and shelter, evacuation movement, construction and engineering, and resources and support operations.

#### **F. Disaster Preparedness**

The "Imperial County Emergency Plan" also addresses Imperial County's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The plan does not apply to normal day-to-day emergencies and the routine procedures used in coping with such emergencies. Instead, the operational concepts in the Emergency Plan focus on potential large-scale disasters that can generate unique situations requiring unusual responses. Such disasters pose major threats to life and property and can impact the well-being of large numbers of people. The Emergency Plan also identifies the sources of outside support which might be provided by other jurisdictions, state and federal agencies, and the private sector through mutual aid and specific statutory authorities.





### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Seismic and Public Safety Element of the General Plan is to be consulted in the implementation of development policies and land uses in Imperial County. This section (Chapter III) of the Seismic and Public Safety Element presents Imperial County's Goals and Objectives relative to all land use decisions within the unincorporated areas of the County. They have been prepared in collaboration with the General Plan Ad-Hoc Advisory Committee appointed by the Board of Supervisors.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for public safety decision making. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Land Use Planning and Public Safety**

Goal 1: Include public health and safety considerations in land use planning.

Objective 1.1 Ensure that data on geological hazards is incorporated into the land use review process, and future development process.

Objective 1.2 Regulate development within flood-way areas in accordance with Federal Emergency Management Agency (FEMA).

Objective 1.3 Regulate development adjacent to or near all mineral deposits and geothermal operations.

Objective 1.4 Require, where possessing the authority, that avoidable seismic risks be avoided; and that measures, commensurate with risks, be taken to reduce injury, loss of life, destruction of property, and disruption of service.

Objective 1.5 Encourage other governmental agencies and the private sector to pursue an objective similar to Objective 1.4.

Objective 1.6 Ensure environmental hazards are considered when siting critical facilities.



Objective 1.7 Require developers to provide information related to geologic and seismic hazards when siting a proposed project.

Objective 1.8 Reduce fire hazards by the design of new developments.

Objective 1.9 Encourage the reclamation of lands where mining, irrigation, landfills, solid waste, hazardous materials/waste storage or disposal, and natural soil erosion has occurred, so as to pose no danger to public health and safety.

Objective 1.10 Encourage underground pipelining of all open canals adjacent to and within urban areas to prevent accidental drownings, without placing unreasonable cost burden on agricultural water users.

Objective 1.11 Recognize that certain lands are unsuitable for high density development and that prohibition or restriction of such high density uses are in the public interest, health, and safety.

## **Emergency Preparedness**

Goal 2: Minimize potential hazards to public health, safety, and welfare and prevent the loss of life and damage to health and property resulting from both natural and human-related phenomena.

Objective 2.1 Ensure the adequacy of existing emergency preparedness and evacuation plans to deal with identified hazards and potential emergencies.

Objective 2.2 Reduce risk and damage due to seismic hazards by appropriate regulation.

Objective 2.3 Identify potential risk and damage due to inundation from dam failure and/or water releases.

Objective 2.4 Support and assist in informing the public and other agencies of the hazards and risks of earthquakes and of techniques to employ to reduce those hazards.

Objective 2.5 Minimize injury, loss of life, and damage to property by implementing all state codes where applicable.

Objective 2.6 Maintain, utilize, and provide geologic and seismic information as furnished by the State Geologist as required.

Objective 2.7 When appropriate situations are identified, require rehabilitation of buildings that pose a public hazard due to inadequate seismic design, or presents a structural hazard.





Objective 2.8 Prevent and reduce death, injuries, property damage, and economic and social dislocation resulting from natural hazards including flooding, land subsidence, earthquakes, other geologic phenomena, levee or dam failure, urban and wildland fires and building collapse by appropriate planning and emergency measures.

Objective 2.9 Reduce vehicle accidents through appropriate standards.

Objective 2.10 Reduce the risk of damage due to subsidence resulting from extraction of groundwater and geothermal resources by appropriate regulation.

### **Control Hazardous Materials**

Goal 3: Protect the public from exposure to hazardous materials and wastes.

Objective 3.1 Discourage the transporting of hazardous materials/waste near or through residential areas and critical facilities.

Objective 3.2 Minimize the possibility of hazardous materials/waste spills.

Objective 3.3 Discourage incompatible development adjacent to sites and facilities for the production, storage, disposal, and transport of hazardous materials/waste as identified in the County General Plan and other regulations.

Objective 3.4 Adopt and implement ordinances, policies, and guidelines that assure the safety of County ground and surface waters from toxic or hazardous materials and wastes.

### **C. Relationship to Other General Plan Elements**

The Seismic and Public Safety Policy Matrix (Table 2) identifies the relationship between the Seismic and Public Safety Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

<b>TABLE 2</b> <b>SEISMIC AND PUBLIC SAFETY ELEMENT POLICY MATRIX</b>								
<b>Issue Area</b>	<b>Land Use</b>	<b>Housing</b>	<b>Circulation</b>	<b>Noise</b>	<b>Agricultural</b>	<b>Open Space Conservation</b>	<b>Geothermal</b>	<b>Water</b>
Land Use Planning	X	X	X			X	X	
Emergency Preparedness	X						X	
Hazardous Materials	X		X					X



#### **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

##### **A. Preface**

This Chapter provides an implementation program to reduce the threat of seismic and public safety hazards within the unincorporated areas of the County. The natural hazards discussed in this Chapter are relative to Imperial County's geography, geology and flooding and is divided into three major topics: Seismic/Geological Hazards; Flood Hazards; and Imperial Irrigation District Lifelines.

##### **B. Programs and Policies**

###### **Seismic/Geologic Hazards**

1. Implement codified ordinances and procedures which require the review and restriction of land use due to possible natural hazards.
2. Monitor, evaluate, and analyze existing seismic and geological data as it pertains to Imperial County to determine future regulations and programs.
3. Implement the geologic hazards section of the County's Codified Ordinances pursuant to the requirements of the Alquist - Priolo Geologic Hazards Zone Act.
4. Ensure that no structure for human occupancy, other than one-story wood frame structures, shall be permitted within fifty feet of an active fault trace as designated on maps compiled by the State Geologist under the Alquist - Priolo Geologist Hazards Zone Act.
5. The County should require suppliers of all existing utilities which cross active faults to file with the County an operation plan describing the probable effects of failures at the fault and the various emergency facilities and procedures which exist to assure that failure does not threaten public safety.
6. Ensure that proposed highway construction which falls within an Alquist - Priolo Act Special Studies Zone shall be reviewed to ensure that grade-separated interchange structures are not located on or near an active fault.
7. Periodically update maps of existing faults, slide areas, and other geographically unstable areas in the unincorporated area of the County.
8. Support the safety awareness efforts of the Office of Emergency Services of Imperial County and other agencies through public information and educational activities.
9. Continue to implement the Alquist - Priolo requirements in designated special study zones in the Imperial County Ordinance.



## **Flood Hazards**

1. Provide technical and policy information regarding flood hazards to developers, interested parties, and the general public.
2. Regulate and restrict development near major water courses and floodplains through application of appropriate land use measures.
3. Both the ground floor elevation of any building for human occupancy and the driving surface, if designated evacuation routes within the 100-year floodplain, shall be constructed above the projected profile of a 100-year flood event.
4. Require all new development for human occupancy within the 100-year floodplain to be adequately flood-proofed.
5. Establish technical design criteria which minimizes or mitigates impacts associated with crossing of floodplains by development. Unless such engineering alternatives are implemented, development in floodplains is to be restricted or prohibited.

## **Imperial Irrigation District Lifelines**

Imperial Irrigation District has a formal Disaster Readiness Standard Operating Procedure for the Water Department, Power Department, and the entire District staff for response to earthquakes and other emergencies. The general policy for the Water Department is as follows:

1. Cooperate with the Imperial County Office of Emergency Service.
2. Lower the level in canals after a need has been determined, and only to the extent necessary.
3. If the need arises, divert the entire flow of the All American Canal at Pilot Knob back into the Colorado River; and divert the remaining water into the Alamo and at the New River where the canal crosses those rivers.
4. Routinely hold water in many of the canals by check gates to maintain availability for domestic uses. This would also be available for fire fighting





## APPENDIX A

### SEISMIC SAFETY TECHNICAL REPORT

#### INTRODUCTION

In terms of seismic activities, Imperial County is similar to most regions bordering the Pacific Ocean. It is an area of high seismic activity. Most of the seismic activity is in the Salton Trough (Imperial Valley) consequently, the Valley is subject to potentially destructive and devastating earthquakes. (Imperial Valley in this instance, encompasses the central area, commonly known as the "irrigated" area.)

Earthquakes, are the result of an abrupt release of energy stored in the earth. This energy is generated from the forces which cause the continents to change their relative position on the earth's surface. This process is called "plate tectonics."

The earth's outer shell is composed of a number of relatively rigid plates which move slowly over the comparatively fluid molten layer below. The boundaries between plates are where the more active geologic processes take place. Earthquakes are an incidental product of these processes.

California rests on the boundary between the North American Plate and the Pacific Plate. The San Andreas Fault system is located where the northwesterly drifting Pacific Plate grinds along and is subducted by the southwesterly drifting North American Plate. Baja, and California west of the fault system, are part of the Pacific Plate and move northwest compared to the rest of California and North America. The relative motion is two inches per year, but the plates do not slide easily past each other as they do over the molten layer below. They stick until the strain exceeds the elastic capacity of the rock which then fractures and allows the sudden movement which is an earthquake.

When sudden movement ruptures the earth's surface, it causes vibrations called seismic waves. Complex methods and equipment have been developed to measure earthquakes. Magnitude is a measurement of the energy released. Intensity is a measurement of the damage done. Earthquake prediction methods have been developed, but at this time it is not possible to tell when or where a quake will occur with any reliability.

#### Effect of Earthquakes

The principal seismic hazards in Imperial County are (1) ground shaking including differential ground settlement, soil liquefaction, rock and mudslides, ground lurching, and avalanches; (2) ground displacement along the fault; (3) floods from dam and levee failure, and seiches; (4) fires; and (5) the various adverse results of disruption of essential facilities and systems - water, sewer, gas, electricity, transportation, and communication (and notably in Imperial Valley, the irrigation and drainage system).<sup>1</sup>

Ground shaking is by far the most important hazard. However, many people believe that fault displacement is the greatest danger. In accordance with the Alquist - Priolo Special Studies Zone



Act (Chapter 7.5, Division 2, Public Resources Code, State of California, effective May 4, 1975) the Office of State Geologist delineated Special Study Zones which encompass potentially and recently active traces of four major faults (San Andreas, Calaveras, Hayward and San Jacinto). These Special Study Zone Maps depicting active fault traces are available for public review at the Imperial County Planning Department and the Imperial County Public Works Department. The Alquist - Priolo Special Study Zone Act is enforced by the County to assure that homes, offices, hospitals, public buildings, and other structures for human occupancy which are built on or near active faults, or if built within special study areas, are designed and constructed in compliance with the County of Imperial Codified Ordinance.

An earthquake is the release of force built up by plate stress and triggered by some action; therefore an earthquake is the triggering event to permit the force of gravity to operate. Rockslides, mudslides, avalanches, slope slumping, and ground settlement illustrate this. Water saturated, sandy and fine grained soils subjected to vibrations may lose their shear strength, take on a liquid character, and fail to support structures (liquefaction). Buildings may "sink" into the soil; lighter structures may be buoyed up.

*Seiches* are earthquake generated waves in small bodies of water. Although there are no records of seiches in the Salton Sea, the following account from the Owens Valley quake of 1872 is instructive: "A huge wave developed in Owen Lake... the water (was) drawn away from the shore and standing in a perpendicular wall... But the return was fairly gentle so only 200 feet of new ground was covered by the waves."<sup>2</sup>

*Floods* from dam failure are a notable secondary effect of earthquakes. Often, in earthquake country, the most economical (and sometimes only) dam site is in a high risk seismic zone. The geological forces generating faults often produce the topographic features desirable for dams. Earthfill dams are obviously more susceptible to seismic induced failure than concrete or other structural dams.

In Imperial County, there are three major dams - Imperial, Laguna, and Senator Wash, located on the Colorado River; and in the irrigated area, several large, earthfill impoundment reservoirs; hundreds of miles of above ground level earth levee canals, and hundreds of check dams, drops and gates. The Colorado River is not a known seismically active zone and, to date, there have been no reported cases of earthquake damage to the dams there. Within the irrigated area, there have been a number of instances of levee failure from earthquakes and resultant flooding. Because of the comparatively small volumes of water involved, low head, variety of options to check or divert flows in the canals, and the ubiquitous drainage network, the flooding hazard is not great. Nevertheless, some hazard does exist and even minor flooding could be an incremental contribution to the other disruptions an earthquake might cause.

## Effects on Structures

Five main factors effect building damage from earthquakes are:

1. The strength of earthquake waves. For record purposes, accelerations over 0.1g are considered "strong shaking" although this level generally does not produce significant





damage. Imperial County's two largest quakes; 1940 and 1979, produced .22g vertical, .36g horizontal, and .38g vertical, .40g horizontal, respectively, as measured at El Centro.<sup>3</sup>

2. The frequency of the waves. Ordinary structures respond mainly to shaking at frequencies higher than 1 Hz (1 cycle per second). These occur out to a maximum of about 20 miles from the epicenter. However, large structures such as large bridges, and/or high-rise buildings respond to frequencies as long as 10 Hz. These may be significant as much as 60 miles away.
3. The duration of the shaking. It is the cumulative effect of the shaking -- not the single pulse -- that affects structures and causes their collapse. Each shake can weaken part of the structure. Subsequent oscillations further weaken the structure especially if magnified by the resonance of the natural frequency of the structure with the frequency of the waves.

Relating strength and duration, it is the "repeatable high ground acceleration (RHGA)" as opposed to the peak ground acceleration that is the main criterion in designing structures to be safe from ground shaking impacts. In this respect, aftershocks also play an important role. They frequently produce substantial damage to buildings weakened by the main shock sequence. The Kern County quake of July 21, 1952 had a magnitude of 7.3. However, most of the actual damage occurred a month later when an ordinarily mild 5.8 aftershock brought down the already weakened buildings.

4. The geologic foundation. Engineers and insurance companies often consider this the most important factor in building damage. Fill and "made" land, especially when saturated, transmits much greater intensity of motion than solid rock even when both are subjected to the same seismic waves. The greater stress on the structure, as well as the possibility of liquefaction, differential settlement, or slope failure, make a poor geological foundation and create a double jeopardy in earthquakes.
5. The building design. Where subjected to the effects of a major event, an "earthquake proof" building may, at least with current technology be impossible to design. Architects and engineers know how to design earthquake resistant structures.

Buildings traditionally are designed first to resist the force of gravity. The traditional building techniques and materials are very good for this: post and beam, bricks, concrete. The loads are very easy to calculate and to design for; "dead load" representing the weight of the building itself, and the "live load" representing the contents of the building, wind, people, furniture, goods, etc. All of these are static and dynamic forces acting in the vertical plane. Often, in older buildings the main force holding the building together is the force of gravity itself - the upper parts pressing down on the lower parts.

When an earthquake occurs, it introduces vertical and horizontal dynamic forces. Newer buildings generally have reasonably large margins of safety designed into them to withstand the constant pull of gravity. Therefore they generally withstand vertical seismic accelerations reasonably well. However, horizontal accelerations and sudden rapid vertical acceleration are what cause the major damage.



During an earthquake, buildings usually fail at the location where their various parts are joined together. Weakened structural sections are then affected by gravity which then may cause them to collapse. The majority of buildings usually "pancake". They seldom fall or roll over. Because there are so many factors that affect the structural integrity of a building, it is possible to have two identical buildings exhibit substantially different results in an earthquake.

The second consideration in traditional building safety design is against fire (also a major secondary effect from earthquakes). Here too, the most resistant materials are stone, bricks, concrete, etc. As buildings became larger, and safer in their resistance to gravity and fire, and to weathering and wind, they become more massive and have greater inertia. Like the damaging seismic forces, wind is dynamic and also acts horizontally. Most of the wind resisting design techniques also resist earthquakes. However, whereas the inertia of massive buildings works positively to help resist horizontal wind forces, it can be detrimental in withstanding horizontal earthquake accelerations.

"Rigid Strength" buildings tend to hold together well with little or no damage from quakes up to the point at which some part fails and then the whole building may come apart... To design "rigid strength" to withstand the greatest expected quakes may require bulk and costs that would prevent the building from ever being built in the first place. There are numerous architectural designs that have been implemented across the world to minimize earthquake damage, such as massive shock absorbers, counter balance weights, floating support systems, etc. Unfortunately most of these solutions are only practical in very large and expensive structures.

The alternative to "rigid strength" is flexibility. Wood (in small buildings), and especially steel, permits construction that will bend and deform, and allow the energy of the earth movements to pass through the building rather than try to resist and absorb the energy. Flexibility permits the construction of buildings which are lighter, freer in design, much less costly, and which still won't completely fail under very large quakes. Wood has both tensile and compressive strength. It is usually readily available, is easy to work and assemble, and is thus both a popular and a fairly good earthquake resistant building material. Its notable failing is at the joints. Where bolts and screws, in addition to nails are combined with steel straps and "strong ties", and plywood is used for shear walls and horizontal diaphragms, quite excellent "flexible strength" can be built into wooden structures up to three stories high. Larger than this, the weight of the structure begins to exceed the "cost effective strength" of the lower floor wooden supports. Since flexible designs do permit various parts of a structure to move in relation to its other parts, damage such as cracked tile and plaster, shattered windows, and broken pipes, may occur from moderate quakes.

Because earthquakes involve dynamic oscillations, building design can also influence its reaction to a quake in ways not expected solely on the basis of strength to accommodate applied force. All things, including buildings, have a natural frequency at which they oscillate. If this natural frequency matches that of the passing seismic waves, the building oscillations may build up to a much greater amplitude than would otherwise occur.

Buildings with irregular layouts or abrupt changes in structural materials have been shown to suffer more earthquake damage than other buildings with the same "strength". Particularly vulnerable are buildings with mixed rigidity and flexibility. A classic example is the house in which a wall opening has been enlarged to install bigger windows. That wall now is weaker, but also more flexible than





its opposite wall counterpart. In a quake, most of the load previously carried by both walls, will be absorbed by the stronger, stiffer wall, and it may fail while the weaker, more flexible wall, remains intact.<sup>4</sup>

An aspect of building design is building orientation. In Imperial County, faults all trend northwest to southeast and fault movement is mostly strike slip. The waves from an earthquake can be expected to be stronger in the northwest/southeast direction. Wise residents in earthquake country are known to take such basic precautions as anchoring furniture, water heaters, and breakables such as china cabinets, in order to diminish hazards. Architects and engineers can apply this knowledge of predominant seismic wave orientation to building and site design.

The foregoing discussion on building design is not meant to suggest design alternatives, as much as to illustrate the necessity to think in terms of "trade offs" and cost versus risk. We cannot prevent earthquakes. We can build resistant characteristics into structures and avoid building those which are particularly susceptible to the effects of earthquakes.

### Seiches

"A seiche is a to and from vibration of a body of water in its own natural tempo like the slopping of water in a jolted basin. Once started, the water body will continue to oscillate independently with its own proper period. Seismic sea waves are only one of the many causes of seiches which often occur also in lakes and ponds."<sup>5</sup>

While there have been a number of seismic events since the formation of the Salton Sea, to date seiches have not occurred to any significant recorded magnitude. There is, however, no guarantee that under specific circumstances one could not occur.

Although "the San Andreas Fault is known to be quite active in the Salton - Imperial Basin, it is difficult to define and almost impossible to trace."<sup>6</sup> In addition to the San Andreas fault, the San Jacinto Fault lies west of the Salton Basin and, on the east side of the Salton Sea, another fault trace is recognizable near Durmid, where sandstone and shale beds on the southwest side of the fault have been opened and contorted near the fault.<sup>7</sup>

Nevertheless, it is reasonable to believe that close proximity of these faults to the Salton Basin implies that the Salton - Imperial Basin could be subjected to an occurrence of significant seismic ground shaking in the future, thus, possibly inducing a seiche.

### SEISMIC HISTORY IN IMPERIAL VALLEY

Reliable accounting of earthquakes began around the turn of the century when Imperial County became inhabited. What evidence exists, suggests that earlier seismic activity was similar to recent activity. Generally only events of intensity V or greater are included here.

The following accounts, (through 1970), are taken largely from *An Earthquake History of the United States* by the U.S. Department of Commerce. The accounts for after 1970 are compiled from a variety of sources, all listed in the reference section.





1853 November. Based on reported effects in distant towns, a large earthquake is believed to have occurred in the northern Salton Trough, probably in the Imperial Valley. A magnitude of 6.5 is estimated for this event.

1853 December. Fort Yuma. Many shocks. Possibly of destructive force.

1868 May. Los Palmas, east and north of Salton Sea. One source states that a long fissure opened in the earth. (If this is true, the intensity was IX, perhaps X).

1871 (Month Unknown). Imperial Valley. Halfway between Los Palmas and Yuma, the shock rolled men over who were sleeping on the ground.

1877 June 11. Imperial County. Violent vibrations preceded volcanic eruption in the mountains near Flowing Well Station, about 60 miles northeast of Yuma.

1892 February 23. Northern Baja California. The intensity of this shock probably reached X near the epicenter, which was apparently in the uninhabited region of northern Baja California. It was felt strongly along the Pacific coast of Baja California, as far as San Quentin, Mexico and as far north as Visalia, California. At Carrizo, all adobe buildings were destroyed; at Jamul, walls of stone kilns cracked. At Campo, there were 155 shocks in 12 hours. After shocks were numerous for several days.

1903 January 23. Baja California. A strong earthquake, centering in the uninhabited region south of Imperial Valley, was felt throughout southern California, southern Nevada, and western Arizona. A similar shock under present conditions in the Imperial Valley would cause damage. Recorded by distant seismographs. Magnitude 7+.

1906 March 3. Southern California. Felt widely in southern California. Origin south of border. Recorded by distant seismographs, which indicates moderately destructive power.

1906 April 18. Brawley, Imperial Valley. Chimneys fell. Banks of New River caved in; water tanks destroyed at Cocopah in Baja California. The published information is very limited, but H. O. Wood, on the basis of verbal information, reported this to be a very severe shock. Magnitude 6+. It came just hours after the great San Francisco quake and most probably was related.

1915 June 22. El Centro, Calexico, and Mexicali. Two destructive shocks, nearly 1 hour apart. Heavy damage (about \$900,000) in southern Imperial Valley was caused as much by poor quality buildings as by the intensity of shock. In El Centro, well constructed buildings merely suffered cracks. At Mexicali, Mexico, people returned to buildings after the first shock; six were killed and many were injured by the second earthquake. Though a few cracks were formed in the alluvium, the irrigation ditches and works were damaged very little. The unstable banks of the New and Alamo Rivers slid down in many places. Several farmers observed that after the shocks, one-third more water was required for irrigation because of the cracks in the soil. Despite the rather high local intensity, the total energy was moderate. Magnitude 6 1/4 for both shocks.



1915 November 20. Baja California. A shock, revealed by seismograms to have been considerably greater than that of June 22, occurred in the Volcano Lake region south of the Mexican boundary. In the Imperial Valley, the highest intensity was at Calexico; at Volcano Lake, levees and damp ground were cracked. Magnitude 7.1.

1917 May 27. Imperial Valley. Seems to have been most severe in open country. Walls were reported cracked at Brawley.

1918 April 30. Calexico, Plate glass broke. Felt over an area of about 100 mile radius.

1919 September 29. Baja California. Levees slumped and many longitudinal cracks were formed in the Volcano Lake region south of Imperial Valley. Reported intensity distribution suggests that more than one shock occurred. A few fore shocks and numerous after shocks.

1919 October 1. Baja California. A shock similar in location and energy to that of September 29.

1921 September 8. South of Imperial Valley. Duration at Calexico 30 seconds, than a second shock of same duration. Felt over a large area; probably of destructive intensity in the epicenter area.

1923 November 5. Calexico. The epicenter was probably near Calexico where a hotel shifted several inches on its foundation and other buildings sustained minor damage. Intensity was about the same at El Centro.

1923 November 7. Baja California. Intensity VII at Calexico. Damage caused by the shock of November 5 was increased, and one fire resulted. A stronger shock than that of November 5. Epicenter appears to have been in Baja California, south of Calexico.

1925 April 15. Calexico. Plaster was shaken from walls; inhabitants fled to the streets. Again, the epicenter probably was a short distance south of the border.

1926 April 19. Baja California. Volcano Lake region. Light at Calexico, duration 20 seconds. Seismograms indicate energy sufficient to be destructive over a small area. Felt as far as San Diego.

1927 January 1. Imperial Valley, near Mexican border. Two heavy shocks about an hour apart began a long earthquake series, though none of the latter exceeded VI in intensity. In Calexico and Mexicali many buildings were damaged, water mains broke, and some fires ignited. Between 15 and 20 persons were injured. At Heber, El Centro, and Imperial, slight damage was reported. At Heber, telephone service was interrupted. Magnitude  $5 \frac{3}{4}$  and  $5 \frac{1}{2}$ , respectively. The after shock of February 12, 00:59, was farther north and was felt as strongly at Brawley as the main shocks. Hundreds of aftershocks occurred.

1930 February 25. Imperial Valley. At Westmorland, walls cracked, chimneys toppled and inferior buildings were damaged. Mud craterlets were found a few miles east of Westmorland. Several fore shocks and many after shocks. Magnitude 5.0.





1930 March 1. Imperial Valley. This shock was of smaller magnitude than that of February 25. At Brawley, brick buildings were damaged, chimneys were thrown down, and plate glass shattered. Structural damage included falling of cornice and walls, severe cracks in walls, and displacement of roofs. Well-constructed buildings sustained little damage. Magnitude 4.5.

1934 December 30 and 31. South of Calexico. Two separate main events, the first, magnitude 6.5 and the second 7.1. It is difficult to determine which event caused what damage. Railroad bridges were damaged and tracks twisted. Surface cracks appeared. Water sprouted in dry river beds. Adobe houses were wrecked and a large water tower was thrown down. Irrigation ditches were damaged, roads buckled and communication systems disrupted. It was felt strongly in Tijuana. Chimneys and walls were thrown down at Calipatria. Intensities XI and X in Baja, VI and VII in Imperial Valley.

1940 May 18. Imperial Valley. Sixty thousand square miles affected in the United States (including Arizona and Nevada) and an unknown area in Mexico. The epicenter was located southeast of El Centro, but there was surface slipping with surface rupture over a known distance of 40 miles. The existence of the Imperial Fault was revealed for the first time. The horizontal displacement reached 19 feet near the border. Vertical displacements up to 4 feet were observed. There was damage at all towns in the Imperial Valley and canals were damaged with serious interruption to water service.

The Alamo Canal (still in use) was opened by the displacement causing a local flood south of the border.

At Imperial, the city water tanks collapsed and 80% of the buildings were damaged. At the more heavily populated town of Brawley, there was greater total damage but less percentage of loss. Possibly 40% of the buildings were damaged, but the percentage was higher in business buildings.

At Holtville, the city's water tank collapsed, but the damage was not great. Damage at Calexico and at Mexicali, Mexico was not as extensive as might have been expected. The principle loss in Mexicali was fire set by a short circuit.

Indirect loss of crops was considerable; direct earthquake loss in the United States was 6 million dollars. Nine lives were lost. Magnitude 7.1, intensity X.

Again, the rest of the decade was relatively quiet. There were eight quakes of magnitude 5 or greater in the area. Six of these came in 1942, with five of these on October 21-22. A landslide damaged the SD&AE railroad bridge in Carrizo Gorge and some cracked plaster was reported throughout the Imperial Valley. A 5.4 event centered south of Borrego, January 8, 1946, caused no damage.

1950 July 29. Imperial Valley. Strongest of the series of shocks centering near Calipatria on July 27, 28 and 29. Fifty thousand dollars in damage resulted, chiefly from merchandise being thrown from the shelves in the Calipatria, Westmorland, and Niland areas. In Calipatria, concrete standpipes broke and a small railroad bridge shifted six to eight inches. There was considerable plaster damage. In the outskirts, sand boils appeared and irrigation ditch banks sloughed. In Westmorland, reinforced concrete walls of the post office building cracked and window broke at the



City Hall and at the Food Center Building. Also felt at Parker and Yuma, Arizona. Magnitude 5.4. A 4.7 aftershock August 1, caused sand boils and ground fissures around the North End Dam.

1951 January 23. Near Calipatria, cracked Westside Main canal. Magnitude 5.6, intensity VII.

1953 June 13-13. Brawley-Westmorland area. Landslides at Tamarack Road and the New River. Windows broken and plaster cracked. First event and aftershock of 5.5, intensity VII.

1954 November 12. A 6.3 event in Baja was strongly felt in the Imperial Valley.

1955 December 16. Brawley area, magnitude 5.4, intensity VII.

1957 April 25. South end of Salton Sea slight damage in El Centro, Brawley and Westmorland, magnitude 5.2, intensity VII.

1958 November 30. Main shock of a series caused minor damage at Calexico and Seeley. Magnitude 5.8, intensity VII.

1963 June 11. A 5.8 event in Baja was felt widely in Imperial Valley.

1965 June 15. A 4.5 main event in a series. Slight damage to buildings, broken windows, and "residents alarmed" in Brawley and Westmorland.

The history of seismic events is also a history of improvements in recording earthquakes and in understanding of seismic phenomena. Two events at this time are notable more for what they revealed about earthquakes than for damage that occurred.

1966 March 4. Imperial. Magnitude 3.6. This quake caused virtually no damage, but did cause surface rupture and horizontal displacement. It is the smallest known earthquake to do so. (Some authorities question these effects.)

1968 April 9. South of Ocotillo Wells. The main shock of a series was felt over a large area of California, Arizona, and Nevada. Minor ground cracking and displacement occurred on the Coyote Creek Fault, and Highway 78 was cracked and adjacent to Ocotillo Wells. Ground cracking, minor building damage, and power disruption occurred in some areas of Imperial Valley. A 200-foot long, 2 inch wide crack occurred in a road 6 miles west of Imperial. Minor damage was also sustained at Calexico, El Centro, Los Angeles, San Diego, and Yuma Arizona. Magnitude 6.5. Intensity VII. Later an aftershock of magnitude 5.2 was widely felt. The significant feature of this earthquake was the triggering of minor ground ruptures on neighboring Superstition Hills Fault, Imperial Fault, and the Banning Mission Creek portion of the San Andreas Fault. A 4.7 aftershock at Calexico knocked down plaster. A 4.4 event, listed as an aftershock, occurred at Salton City on May 22.

1969 May 19. A 4.5 quake near Borrego Springs was felt in San Diego, Riverside and Imperial Counties. There was no damage.

1971 September 30. Superstition Hills area, magnitude 5.1. No known effects.





1975 January 23-25. Eight events from 4.0 to 4.8 in the Brawley are. The smallest, on January 23 was assigned the highest intensity VII, but there was no significant damage recorded.

1975 June 20. Two events at Mexicali of 4.1 and 4.2.

1976 November 4. Eight events from 4.0 to 4.9 in the Calipatria area with no recorded significant effect.

1977 October 20 to November 14. Eight events from 4.0 to 4.3 southeast of El Centro, but with no recorded damage or effects.

Seismic activity from 1940 to 1979 was characterized by "earthquake swarms" with little or no damage. These were in addition to and sometimes associated with the individual events and series of events listed above. They occurred in 1950, 1955, 1966, 1973, 1975 and 1976. For example, eighty-two separate tremors were reported felt in Brawley between December 16 and 20, 1955. The 1975 Brawley swarm was studied in detail by C.E. Johnson and revealed complex interaction between the Brawley and Imperial Faults. These "swarms" were composed of dozens, and sometimes hundreds, of events in the range of 2.0 to 4.0.

Seismic monitoring arrays installed by Chevron and Union Geothermal Companies, to assist in their exploration of the geothermal reservoirs and to determine what effects their operations might cause, have sensitivities of 1.0 Richter magnitude. They frequently reveal hundreds of events daily. There is no easy way to tell if these "swarms" and "microseismicity" (events less than 2.0 Richter magnitude) are normal to the Valley and not recorded in earlier years, or are a change in the normal pattern.

1979 October 15. The earthquake occurred at 4:16 p.m. (PDT). The epicenter was on the Imperial Fault approximately 12 miles south of the Mexican border and 12 miles east of Mexicali. It was widely felt throughout Southern California, and was assigned a magnitude of 6.6 ML (Richter). Two aftershocks of 5.0 or greater occurred by 9:00 p.m.

Approximately 100 persons were reported injured; two were hospitalized. The six story County Services Building, the largest building ever built in Imperial County, suffered the most notable damage resulting in its subsequent demolition and total loss. It was occupied by 400 persons at the time of the quake. None were seriously injured. Commercial damage was widespread, particularly in the older sections of Imperial, Calexico, Brawley, El Centro, and Mexicali. Sixty percent of the commercial buildings in Imperial were subsequently condemned. Windows and bottle goods were the major loss. One hundred and three mobile home units in El Centro were knocked from their piers. Throughout the quake area (in Imperial County) two homes were destroyed and 1,565 damaged. Broken windows, cracked plaster, and collapsed brick chimneys were typical.

One 30,000 gallon gasoline tank (among 18 at the Southern Pacific Tank Farm at Aten and Clark Roads) were ruptured and began leaking 100 gallons per minute. It was controlled by the next morning. All roads within one mile were closed and ten families in the area were evacuated.





There were 15 ruptures of water mains in El Centro and a temporary loss of ninety percent of the fire fighting capability. The Southern Pacific Railroad tracks were offset nine inches where they cross the Imperial Fault. Traffic was halted for 30 hours. Interstate 8, Routes 98 and 80 were damaged where they crossed the fault. The New River Bridge west of Brawley suffered serious damage by an aftershock about midnight. The west end of Runway 26 at the Naval Air Facility settled. The runway was closed 62 days for repairs. Sewage treatment plants in El Centro, Brawley, and Imperial were seriously disrupted. Clarifiers at all three were knocked out, pumps at Imperial were misaligned and subsequently burned out, and miscellaneous other damage occurred. All exceeded their holding capacity and dumped raw sewage into the drainage system. Normal service was not restored for from 2 to 6 months. Estimates of sewer main ruptures have never been summarized.

The All American Canal suffered major slumping to its embankments on both sides for an eight mile stretch in the vicinity of the Imperial Fault. There were extensive slope failures in many of the other canals. The IID immediately reduced flow to about fifteen percent and later shut the entire irrigation system down for several days for inspection and repairs. (Although media accounts, and the "staff report" state this, the system never was completely "shut down".) There was extensive drainage tile damage in fields crossed by the fault.

Electrical power was out in parts of the Valley for 3 to 4 hours. Several key emergency generators failed to function - one for the County fire station and control tower at the Imperial Airport and another at a local hospital. All hospitals remained otherwise functional with only minor damage. Students were not in class at the time of the quake. Schools remained closed the following day to assess damage. It was all non-structural -- estimated at \$345,000, "County-wide". Telephone and telegraph facilities were undamaged, but became inoperative due to overload of attempted calls for up to 18 hours in certain areas. This seriously interfered with emergency analysis and response. Local radio and television (including designated Emergency Broadcast Station) were off the air for about an hour. Total loss was estimated at \$30,000,000.

1981 April 27. Westmorland. Magnitude 5.6 Intensity VII. There was more damage to Westmorland than resulted from the October 1979 quake. Several commercial buildings and 16 homes were substantially damaged. The water tower, and the water and sewage treatment plants received \$500,000 damage. A quarter mile of the concrete lined Vail Canal was broken up. An eight inch crack opened in Lack Road. There were no injuries, nor significant damage reported elsewhere in the valley.

The swarm of thirty quakes (seven between 3.0 and 4.1) occurred over a 12 hour period three days before the main quake. More than three dozen quakes (over 3.0) occurred in the 24 hours afterwards.

This quake apparently ruptured underground gasoline storage tanks, which was revealed months later with fumes and seepage into surface waters.

1985 May 8. An earthquake measuring 5.2 on the Richter Scale, rocked a large uninhabited area of the Mexican desert 65 miles southwest of Calexico, but there were no reports of damage or injuries, authorities said.



The quake was followed by a series of aftershocks, including one that registered 4.3 on the Richter Scale, according to a spokesman for the California Institute of Technology at Pasadena.

1986 July 8. A quake struck 12 miles northwest of Palm Springs measuring 5.9 on the Richter Scale of ground motion. It did an estimated \$5.75 million damage and injured 40 people. Numerous aftershocks, some measuring as high as 4.0 on the Richter scale, have jostled the area since then.

1986 July 13. A 5.3 earthquake epicentered 28 miles southwest of Oceanside in the Pacific Ocean. The quake was felt as far away as Yuma, AZ, 160 miles east of San Diego, but caused no reported damage or injuries in Imperial Valley.

1987 February 6. A strong earthquake shattered windows and disrupted power in Mexicali and briefly interrupted phone service in the Imperial Valley but there were no reported injuries, authorities said. The trembler registered 5.6 on the Richter Scale and was centered 19 miles southeast of Mexicali according to a spokesman of Caltech in Pasadena.

The quake was felt as far east as Yuma, about 60 miles from the epicenter and as far west as San Diego.

1987 November 23-24. Two strong earthquakes, which registered 6.0 and 6.3 on the Richter Scale, caused widespread damage, but few injuries were reported. The Calexico area was apparently the hardest hit by the trembler, which was centered near Westmorland.

Two bridges, on Forrester Road over the New River and on Worthington Road over the New River were damaged according to the County Public Works Department. The California Highway Patrol also reported that Keystone Road between Forrester and Highway 86 is closed because of bridge damage.

1988 January 25. A large earthquake struck Baja California, Mexico, shaking some Californians awake but triggering no immediate damage reports either north or south of the border, officials said.

The quake registered 5.3 on the Richter Scale was centered in a sparsely populated area about 45 miles east of the resort city of Ensenada according to a spokesman of the California Institute of Technology in Pasadena. The U.S. Geological Survey in Golden, Colorado, measured the quake at 5.0. There were no reports of damage in Imperial County.





## ENDNOTES

1. Robert Iacopi, *Earthquake Country*, (California:Menlo Park, Lane Books, 1976):58-60.
2. Matthews H. William, *Geology Made Simple*, (New York:Doubleday & Company, Inc., 1982):78.
3. The World Book Encyclopedia, 1988 Edition, *Flash Flood*, (Chicago:World Book Inc., 1987 F Volume 7):237.
4. Office of Emergency Services Imperial County, *Imperial County Emergency Plan*, (June 1988):Appendix 1-3, 57.
5. Federal Emergency Agency, *Flood Insurance Study Imperial County, California Unincorporated Areas*, (September 15, 1983):4.
6. Ibid. p. 4.
7. Ibid. p. 5.



## **APPENDIX B**

### **STORAGE SITES, HANDLERS, AND VENDORS OF HAZARDOUS MATERIALS AND WASTE**

This report contains a summary of the largest concentrations of hazardous material and the obvious sources of massive leaks or spills in the County of Imperial. Space requirements of this document preclude the listing of every potential source of hazardous material and waste. This type of detailed information may be obtained by contacting the County of Imperial Department of Health Services.

#### **1. Santa Fe Pacific Pipe Line Tank Farm**

The Santa Fe Pacific Pipe Line Tank Farm is located at Aten Road and the Southern Pacific Railroad junction in the southeast quadrant of the City of Imperial. This facility is a component of the Santa Fe Pacific Pipe Line network that delivers gasoline, diesel, and jet fuel to Southern California and Arizona. The tank farm contains 16 storage tanks, in varying sizes, with a total storage capacity of approximately ten million gallons.

#### **2. Naval Air Facility (El Centro)**

The Naval Air Facility (El Centro) is serviced by a four-inch fuel line directly from the Santa Fe Pacific Pipe Line Tank Farm. Safety devices include manual and automatic shutoff valves, as well as pressure regulators. The facility also stores one million gallons of fuel, which is predominantly jet fuel, in underground tanks. Munitions storage is limited to aircraft and small arms training ammunition.

#### **3. ST Services**

ST Services is located south of the Santa Fe Pacific Pipe Line Tank Farm and has the capacity to store 70,000 gallons of fuel.

#### **4. Brea Agricultural Service**

Brea Agricultural Service is located at 89 East Main Street in the City of Heber and serves as a chemical and fertilizer storage facility.

#### **5. United Agriculture Products**

United Agriculture Products is located at 2415 Clark Street in the City of Imperial. This facility handles hazardous wastes, chemicals, insecticides, and pesticides.

#### **6. Puregro Company**

The Puregro Company is located at 10th Street and River Drive in the City of Brawley. This facility handles chemicals and fertilizers.



**7. Rockwood Chemical Company**

Rockwood Chemical Company is located at 47 West Rutherford Road in Brawley. This facility handles chemical and fertilizers.

**8. Helena Chemical Products**

Helena Chemical Products is located at 101 East Carey Road in the City of Brawley. This facility handles chemicals, fertilizers, insecticides, and pesticides.

**9. Wilbur Ellis Company**

The Wilbur Ellis Company is located at 45 West Danenberg Road in the community of Heber. This facility handles chemicals, fertilizers, insecticides, and pesticides.

**10. Pipelines**

There are 89.92 miles of pipeline in Imperial County that transport hazardous material. Pipe sizes vary in size from 12 to 20 inches and the average size is 12 inches. Pipelines are located adjacent to the Southern Pacific tracks from the Arizona border at Yuma to the Niland tank farm, north to the Riverside County Line, and south to the Imperial tank farm. The pipeline system has section fuel control valves.

Source: 1988 Imperial County Emergency Plan







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agricultural element

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## **IMPERIAL COUNTY GENERAL PLAN AGRICULTURAL ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

Imperial County contains one of the finest agricultural areas in the world. This accomplishment is due to several environmental and cultural factors including good soils, a year-round growing season, the availability of adequate water transported from the Colorado River by a complex canal system, extensive areas committed to agricultural production, a gently sloping topography, and a climate that is well-suited for growing crops and raising livestock. In recognition of the importance of agricultural production to Imperial County, and in view of several potential threats to continued success, the County Board of Supervisors directed that an Agricultural Element be developed.

Adoption of the Agricultural Element of the Imperial County General Plan demonstrates the long-term commitment by the County to the full promotion, management, use, and development and protection of agricultural production. This Element will guide County staff activities, inform current and prospective developers of agricultural and non-agricultural lands, and provide general information and reference about the County's agricultural goals and objectives.

The Agricultural Element and the implementing County Ordinances for agricultural operations, activities, and industries shall ensure compatibility with adjacent land uses and provide clear guidelines for decisions in agricultural areas. The policies and objectives of this Element shall legally bind the County, just as other policies and objectives are intended to satisfy the law for the State-mandated Elements in the County's General Plan. This Element provides an informational base for the various policies and implementation of Imperial County agriculture; it does not zone, regulate, tax, or provide staffing for agricultural activities.

The Agricultural Element is composed of four chapters:

Chapter I describes the nature of the Agricultural Element, its relationship to the General Plan as authorized by the California Government Code, and benefits of agricultural production.

Chapter II examines existing conditions, trends, and issues of agricultural production in Imperial County.

Chapter III presents the goals and objectives of the Element.

Chapter IV identifies implementation programs and plans.



## **B. Purpose of the Agricultural Element**

The Agricultural Element is an optional Element of the Imperial County General Plan, as permitted by Section 65303 of the California Government Code. Although this Element is not mandatory, it must comply with requirements that are requisite to all Elements of the General Plan. Legislative intent must be fulfilled as set forth in Section 65300.5 of the Government Code: "... The General Plan and the parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency...".

This Element is intended to be a comprehensive, internally consistent, and long-term expression of community goals with regard to agriculture, and will serve as the foundation for development decisions by the County Board of Supervisors. An overall purpose of the Element is to describe the status and trends of agricultural resources in the planning area and to identify the goals, objectives, policies, and measures and time frames related to conserving agricultural lands while minimizing or avoiding conflicts with urban and other land uses.

It is noteworthy that on August 21, 1973, the Board of Supervisors adopted the Open Space Element of the County General Plan which states the following:

The preservation of prime agricultural lands is beneficial to the public at large and adopted policies should encourage this end. The identification and preservation of prime agricultural land, based upon soil characteristics, crop types, and water supply should provide the foundation for a rational and defensible preservation program. Refinement and clarification of the goals, policies, and objectives necessary to maintain the economic viability and importance of agriculture in Imperial County, will be found in the Proposed Agricultural Element... (p. 23).

The County Board of Supervisors appointed an Ad Hoc Advisory Committee in 1990 to help the County prepare a General Plan Update. On August 23, 1990, the Ad Hoc Advisory Committee decided to recommend that an Agricultural Element be prepared for the General Plan. On October 9, 1990, the Board reviewed the Committee's recommendation and approved the preparation of this new portion of the General Plan. Although the County has long recognized the value and need for preservation of prime agricultural lands, the present Agricultural Element is the first to be prepared.

Also in 1990, the Agricultural Commissioner's Office prepared and obtained the approval of the Board of Supervisors for the "Right-to-Farm Ordinance". The Agricultural Ordinance states, in part, that "It is the declared policy of this County to enhance and encourage agricultural operations within the County. It is the further intent of this County to provide to residents of this County proper notification of the County's recognition and support through this ordinance of those persons' and/or entities' right to farm."





### **C. Benefits of Imperial County Agriculture**

Agriculture has been the single most important economic activity of Imperial County throughout the 1900s, and is expected to play a major economic role in the foreseeable future. The gross annual value of agricultural production in the County has hovered around one billion dollars for the last several years, making it the County's largest source of income and employment. Agriculture also represents a major source of tax revenue for the County, and supports the purchase of numerous local goods and services. The County's overall economic stability and well-being are intricately related to the economic status of this industry.

Aside from economic benefits, Imperial County agriculture is a major producer and supplier of high quality plant and animal foods and non-food products. Over 120 types of crops are grown in the County. Field crops (such as alfalfa), row crops (such as lettuce, carrots, and melons), and livestock (especially cattle) represent significant contributions to the nation's diet, health, and well-being. In addition, Imperial County agriculture makes efficient use of land, water, good soil, climate, and other natural resources.

The agricultural system is currently diversifying by the establishment of aquaculture and possible reintroduction of significant dairy production. Aquaculture offers an opportunity to put poorly drained clay soils which are only marginally useful for traditional agriculture to productive, high valued crop use. The ratio of crop value to land used by aquaculture is relatively high. Most existing aquaculture operations were started with capital brought into Imperial County. Capital improvements made to real property and equipment purchased for these operations add substantially to the County property tax base, and most aquatic products are sold out of the County, thus bringing new money into the County. Imperial County stands to benefit immensely from these industries which, among other benefits, provide year-round employment and job opportunities to people at many educational and skill levels.

An indirect benefit of agriculture in Imperial County is the creation of modified wetlands that attract useful and beneficial wildlife. The numerous canals, irrigated fields, reservoirs and evaporation ponds, aquaculture facilities, and the Salton Sea provide important habitats for various listed, protected, and other animal, bird, reptile, and fish species. Considerable recreational fishing and hunting is also made possible as a side benefit of agriculture. Under certain circumstances, agricultural facilities may qualify as constructed wetlands and satisfy state and federal concerns over the net loss of wetlands.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

Agricultural production has been the major economic industry in Imperial County throughout the 1900s. This chapter summarizes the early historical development of this industry, describes the existing conditions, and reviews recent trends and issues related to continued production.

### **B. History of Imperial County Agriculture**

Ethnohistoric research has demonstrated that upon European contact in Imperial County in the 1700s, the Kamia Indians, a desert subgroup of the Kumeyaay (Diegueño) Indians whose territory included coastal and inland regions of San Diego County, were using dams and ditch systems to irrigate land along the New and Alamo Rivers. Annual flooding of the Colorado River made desert cultivation of corn, beans, squash, pumpkins, gourds, and watermelon possible.

Dr. Oliver M. Wozencraft, in 1849, was one of the first newcomers to the County to recognize the region's potential for irrigation development. Irrigation water was first delivered to the Imperial Valley in June 1901, by the California Development Corporation by diverting it from the Colorado River through a channel cut in Mexico to the Alamo River. After crossing the International Border east of Calexico, water was diverted from the stream to irrigate crops. Until this time, although many people traveled through Imperial County, the area held little attraction for settlers. Irrigation by the Alamo Canal Project soon led to a substantial population base in the area and the establishment of several towns. More irrigation ditches were completed and rapid development occurred as settlers poured into the area.

In 1905 the Colorado River flooded and ran uncontrolled through Imperial Valley, inundating 488 square miles of farmland and creating the Salton Sea. Several decades were required to improve the water delivery system, culminating in the completion of the All American Canal, which replaced the Alamo Canal, in 1941. With a reliable water system, operated by the Imperial Irrigation District since 1911, and the construction of the Southern Pacific Railroad and paved highways, the County's population and agricultural industry grew. All larger towns and most smaller communities grew up as agricultural centers or shipping stations. Today, agriculture remains the main economic resource in Imperial County.

### **C. Existing Conditions**

For the purposes of this Element, discussion of the existing conditions is separated into the two major types of agricultural production in Imperial County: irrigated crop production, and livestock production (including aquatic products).





## 1. Irrigation Agriculture

Imperial County covers an area of 4,597 square miles or 2,942,080 acres. Approximately 20 percent of the land is irrigated for agricultural purposes, most notably the central area known as Imperial Valley (512,163 acres; *Imperial County General Plan Overview*, September 1985). Two other major irrigated areas are Bard Valley (14,737 acres) in the southeast corner of the County, and Palo Verde Valley (7,428 acres) in the northeast corner (Figure 1).

Favorable climate, productive soils, and the availability of irrigation water have permitted Imperial County to become a leading producer of agricultural products. Irrigation agriculture in the County is extremely diverse and includes numerous types of vegetable crops including lettuce, carrots, onions, tomatoes, cauliflower, and broccoli; alfalfa, Sudangrass, and other animal feed; sugar beets; wheat and other grains; melons; cotton; and various citrus, fruits, and nuts. In 1990, Imperial County surpassed one billion dollars in gross income from all agricultural products combined, and in 1988, 1989, and 1991, the gross income was a little under the one billion dollar figure (Table 1). Vegetable and melon crops, as a category, have traditionally represented the highest gross value, followed by field crops, fruit and nut crops, seed crops and nursery products, and apiary products (Figure 2). Detailed descriptions of crop production values and acreages cultivated are provided annually in the *Imperial County Agricultural Crop & Livestock Report* by the Agricultural Commissioner.

Two resources that are vital to past and future agricultural production are productive soils and adequate water. A review of these two resources is important for placing many of the trends, issues, goals, and objectives raised in this Element into perspective.

### a. Productive Soils

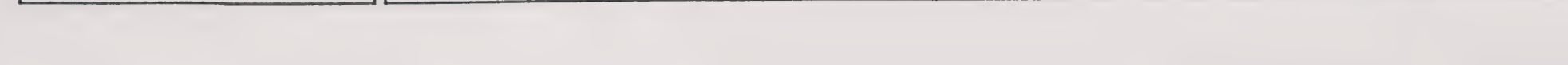
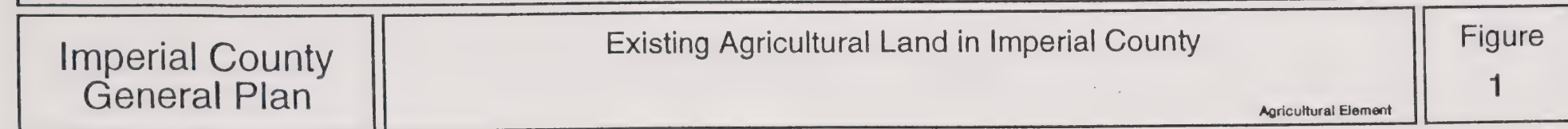
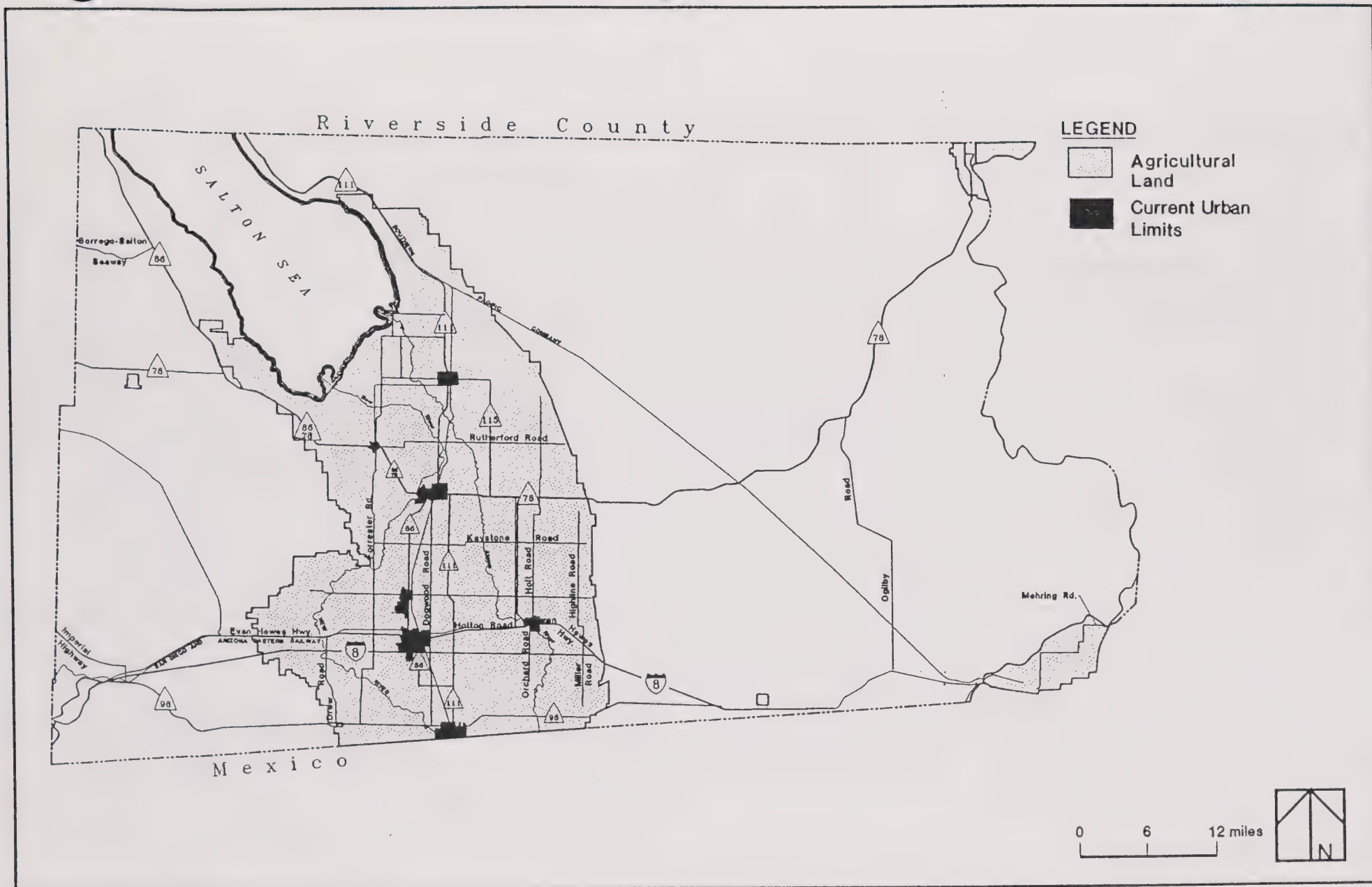
The rich soils of Imperial County, and particularly of the Imperial Valley, were created by periodic flooding of the Colorado River over thousands of years which left deep, rich deposits of silt. Information on the adequacy and importance of soils in Imperial County, taking into account general soil conditions and characteristics, is available from two important sources: the U.S. Department of Agriculture Soil Conservation Service, and California State Department of Conservation. The Soil Conservation Service (SCS) has grouped soils into eight capability classes according to their suitability for most kinds of field crops. These classes are defined as follows:

**Class I.** Soils have few limitations that restrict their use.

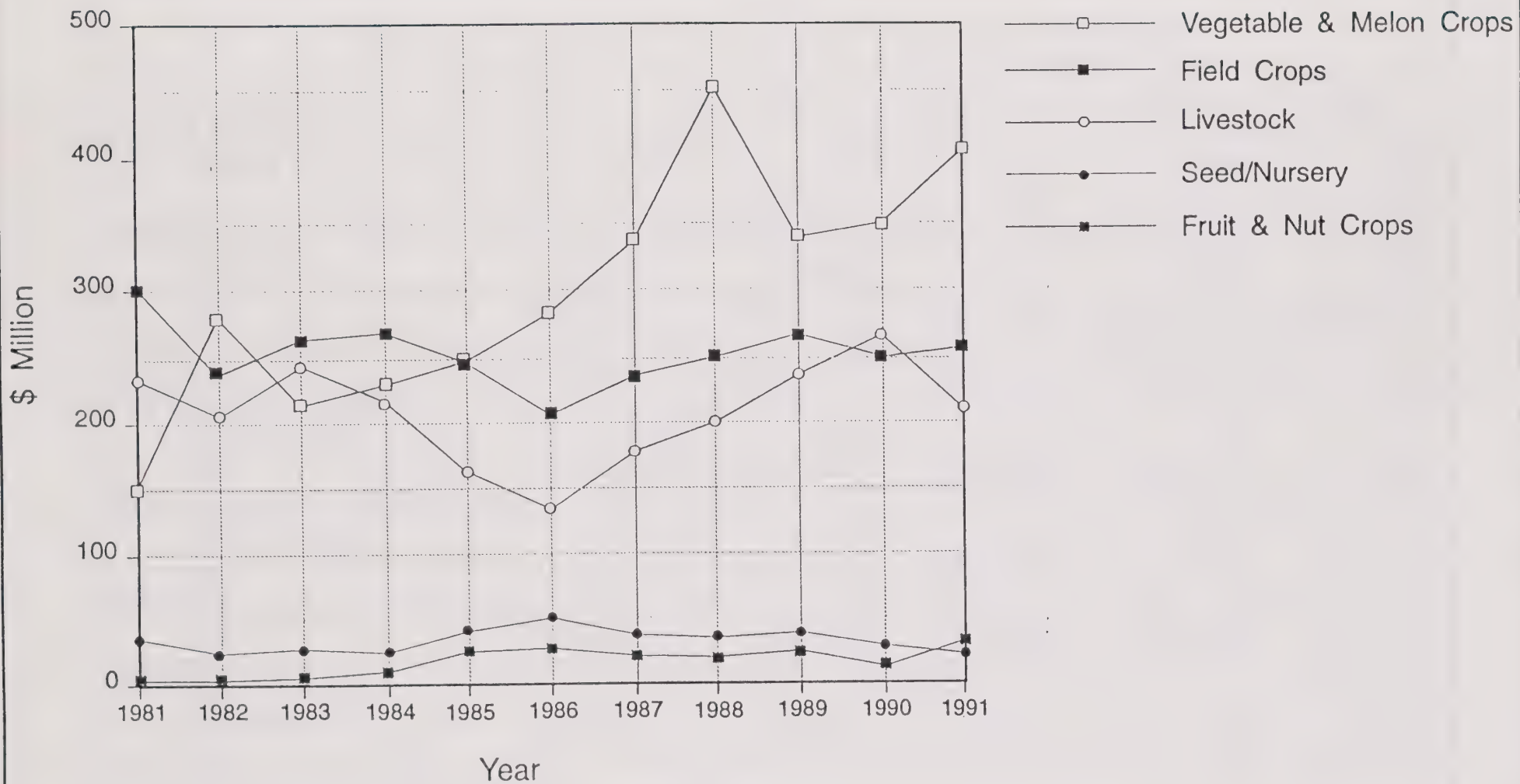
**Class II.** Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

**Class III.** Soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.













**TABLE 1**  
**SUMMARY OF IMPERIAL COUNTY AREA HARVESTED AND GROSS INCOME,**  
**BY MAJOR AGRICULTURAL COMMODITY CATEGORY, FOR 1987-1991**

Commodity	1991	1990	1989	1988	1987
<b>Vegetable &amp; Melon Crops</b>					
Harvested Acreage	136,119	149,425	136,887	119,064	109,831
Value	\$409,470,000	\$354,868,000	\$399,013,000	\$452,069,000	\$337,853,000
<b>Field Crops</b>					
Harvested Acreage	380,534	371,598	373,250	349,281	345,138
Value	\$254,895,000	\$346,497,000	\$272,114,000	\$250,815,000	\$226,934,000
<b>Livestock</b>					
Value	\$217,696,000	\$264,262,000	\$240,298,000	\$204,061,000	\$177,725,000
<b>Fruit &amp; Nut Crops</b>					
Harvested Acreage	4,433	3,527	4,483	4,371	7,374*
Value	\$35,239,000	\$20,915,000	\$25,483,000	\$28,458,000	\$22,000,000
<b>Seed Crops &amp; Nursery Products</b>					
Harvested Acreage	40,391	41,248	49,293	49,592	47,662
Value	\$32,833,000	\$26,868,000	\$36,968,000	\$33,601,000	\$36,525,000
<b>Apiary Products</b>					
Value	\$2,596,000	\$3,401,000	\$3,565,000	\$4,613,000	\$4,778,000
<b>Total</b>					
Harvested Acreage	561,477	565,798	563,913	522,308	510,005
Value	\$952,729,000	\$1,016,811,000	\$977,441,000	\$973,617,000	\$805,815,000

\* included jojoba; moved to field crops in 1988.

Source: Imperial County Agricultural Crop and Livestock Reports



**Class IV.** Soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

**Class V.** Soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

**Class VI.** Soils have severe limitations that make them generally unsuitable for cultivation.

**Class VII.** Soils have very severe limitations that make them unsuitable for cultivation.

**Class VIII.** Soils and landforms have limitations that nearly preclude their use for commercial crop production.

Although only Class I and II soils are normally considered as prime (Section 51201(c) of the California Government Code), the Open Space Element of the 1973 Plan indicated that Class III soils, which comprise most of the Imperial Valley and about 90% of the irrigated area in Imperial County, have the potential for prime agricultural production, given appropriate climatic and water conditions. For the purposes of this Agricultural Element, the SCS definition of prime agricultural soils continues to be applicable to Class I, II, and III soils. A significant portion of Imperial County is therefore highly suited for agricultural production if adequate quantities of irrigation water are available.

Class II soils are scattered in the northwest, west canal, and southeast portions of the irrigated area; the San Felipe Creek areas; in the vicinity of the Salton Sea Test Base, and the Bard area. While some of these Class II soils are presently not irrigated, they warrant preservation as prime soils. An extensive area of nonirrigated Class III soils is located east of the East Highline Canal. Barring the availability of substantial amounts of irrigation water from a new source, noticeable expansion of irrigated acreage appears unlikely.

Additional details on soil characteristics are provided in the Open Space and Conservation Element. Also, the Soil Conservation Service maintains an office in El Centro with detailed maps depicting the various types and locations of soils found in the County, and should be consulted for more information.

The Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) was implemented in 1982, largely as a result of growing public concern over farmland losses in California. The program is mandated by Government Code Section 65570, Open Space Subventions. For land inventory purposes, categorical definitions of important farmlands were developed by the SCS, recognizing the land's suitability for agricultural production, rather than reflecting only the physical and chemical characteristics of soils.

The first Important Farmland Maps were compiled in 1984 and subsequently updated in 1986, 1988, and 1990. The major purpose of the FMMP is to monitor conversion of the state's agricultural land. The aim of the program is to provide for: 1) an inventory of important farm and grazing lands in





the form of Important Farmland Series Maps; 2) an inventory of land locally planned for, and/or committed to, future urban development; and, 3) biennial revision of the Important Farmland Series maps to identify and report conversion of land to and from agricultural use to the legislature, local government, and the public. Lands mapped in Imperial County coincide with those lands included by the SCS in the soil survey of the Imperial Valley, the Palo Verde, and the Winterhaven-Bard areas.

The Important Farmland Series maps use the eight classification categories summarized below and defined in Appendix A.

**Prime Farmland.** Land with the best combination of physical and chemical characteristics for the production of crops.

**Farmland of Statewide Importance.** Land with a good combination of physical and chemical characteristics for the production of crops.

**Unique Farmland.** Land of lesser quality soils used for the production of the State's leading agricultural cash crops.

**Farmland of Local Importance.** Nonirrigated and uncultivated land with Prime and Statewide soil mapping units.

**Grazing Land.** Land on which the existing vegetation is suited to the grazing of livestock.

**Urban and Built-Up Land.** Land occupied by structures or infrastructure to accommodate a building density of at least one unit to one and one-half acres, or approximately six structures to ten acres.

**Other Land.** Land which does not meet the criteria of any other category.

**Land Committed To Nonagricultural Use.** Land that may currently be in agriculture but which has been permanently committed by local elected officials to nonagricultural development.

The FMMP regards four of the categories -- prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance -- as "important farmland." Based upon the most recent (1992) FMMP map and report, Imperial County currently has a little less than 560,000 acres of important farmland.

As part of the FMMP, the Department of Conservation produces a Land Conversion Report to accompany each biennially updated Important Farmland Series map. Table 2, adopted from the 1988-1990 Land Conversion Report, summarizes Imperial County land use data for 1988 and 1990. As indicated in Table 2, a total of 559,435 acres were used as agricultural land in 1990, which



**TABLE 2**  
**IMPERIAL COUNTY LAND USE SUMMARY AND CHANGE FROM 1988 TO 1990**

Land Use Category	Total Acreage Inventoried		1988-90 Acreage Changes			
	1988	1990	Acres Lost (-)	Acres Gained (+)	Total Acreage Changed	Net Acreage Changed
Prime Farmland	214,369	214,534	863	1,028	1,891	165
Farmland of Statewide Importance	318,364	317,757	1,519	912	2,431	-607
Unique Farmland	831	783	48	0	48	-48
Farmland of Local Importance	27,266	26,361	909	4	913	-905
<b>Important Farmland Subtotal</b>	<b>560,830</b>	<b>559,435</b>	<b>3,339</b>	<b>1,944</b>	<b>5,283</b>	<b>-1,395</b>
Grazing Land	0	0	0	0	0	0
<b>Agricultural Land Subtotal</b>	<b>560,830</b>	<b>559,435</b>	<b>3,339</b>	<b>1,944</b>	<b>5,283</b>	<b>-1,395</b>
Urban Build-Up Land	19,219	20,408	0	1,189	1,189	1,189
Other Land	447,744	447,879	1,379	1,514	2,893	135
Water Area	375	446	0	71	71	71
<b>Total Area Inventoried</b>	<b>1,028,168</b>	<b>1,028,168</b>	<b>4,718</b>	<b>4,718</b>	<b>9,436</b>	<b>0</b>

Source: Table C-7, 1992 Farmland Mapping and Program Land Use Conversion Report (Department of Conservation)



represented a net loss of 1,395 acres from 1988. Although there was a slight increase in "prime farmland" (165 acres), the other three important farmland categories represented losses (1,560 acres combined).

It is noteworthy that "Urban and Built-Up Land" increased by 1,189 acres from 1988 to 1990 (Table 2). As indicated in Table 3, which details actual conversions from category to category, 908 acres of the 1,189 acres of new Urban and Built-Up Land came from important farmland (the remaining 281 acres came from "Other Land").

A major agricultural land use issue addressed in this Element is the continued viability of agricultural production and preservation of agricultural land. As noted above, the County Board of Supervisors recognized the potential threats to agricultural productivity posed by increased non-agricultural land uses, and on August 7, 1990 approved the "Right-to-Farm" Ordinance (Ordinance No. 1031; see Appendix B). Upon adoption of this ordinance, the following "notice", prepared by the Agricultural Commissioner's Office, was mailed to all owners of real property in Imperial County. This notice is also provided to potential purchasers of property in Imperial County, and is attached to all building permits issued for projects that exist on or within 1/4 of a mile of agricultural land:

**IMPORTANT NOTICE  
FROM THE BOARD OF SUPERVISORS OF IMPERIAL COUNTY  
DISCLOSURE REQUIRED BY IMPERIAL COUNTY CODIFIED ORDINANCE  
SECTION 62103**

**RIGHT TO FARM**

The County of Imperial permits operation of properly conducted agricultural operations within the County. If the property you are purchasing or own is located near agricultural lands or operations or included within an area zoned for agricultural purposes, you may be subject to inconvenience or discomfort arising from such operations. Such discomfort or inconvenience may include, but are not limited to: noises, odors, light, fumes, dust, smoke, insects, chemicals, operation of machinery (including aircraft) during any 24 hour period, storage and disposal of manure, and the application by spraying or otherwise of chemical fertilizers, soil amendments, herbicides and pesticides. One or more of the inconveniences described may occur as a result of any agricultural operation which is in conformance with existing laws and regulations and accepted customs and standards. If you live near an agricultural area, you should be prepared to accept such inconvenience or discomfort as a normal and necessary aspect of living in a county with a strong rural character and an active agricultural sector. Imperial County has established a grievance committee to assist in the resolution of any disputes which might arise between residents of this county regarding agricultural operations. If you have any questions concerning this disclosure, please contact the Agricultural Commissioner's Office at 339-4314.





**TABLE 3**  
**IMPERIAL COUNTY LAND USE CONVERSIONS FROM 1988 TO 1990**

Land Use Category	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Grazing Land	Total Agricultural Land	Urban Built-up Land	Other Land	Water Area	Total Converted to Another Use
Prime Farmland to:	0	40	0	0	0	40	154	621	48	863
Farmland of Statewide Importance to:	16	0	0	4	0	20	706	770	23	1,519
Unique Farmland to:	0	0	0	0	0	0	48	0	0	48
Farmland of Local Importance to:	266	520	0	0	0	786	0	123	0	909
Grazing Land to:	0	0	0	0	0	0	0	0	0	0
Agricultural Land Subtotal	282	560	0	4	0	846	908	1,514	71	3,339
Urban Build-Up Land to:	0	0	0	0	0	0	0	0	0	0
Other Land to:	746	352	0	0	0	1,098	281	0	0	1,379
Water Area to:	0	0	0	0	0	0	0	0	0	0
<b>Total Acreage Converted to:</b>	<b>1,028</b>	<b>912</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>1,944</b>	<b>1,189</b>	<b>1,514</b>	<b>71</b>	<b>4,718</b>

Source: Table C-7, 1992 Farmland Mapping and Monitoring Program Land Use Conversion Report (Department of Conservation)



Although a major intent of this ordinance is to reduce the loss to the County of its agricultural resources, an important, related purpose is to promote a good neighbor policy by advising purchasers and users of adjacent properties about the potential problems and inconveniences associated with agricultural operations. The ordinance also establishes a "County Agricultural Grievance Committee" to settle disputes between agriculturalists and adjacent property owners.

In summary, the USDA Soil Conservation Service and the California Department of Conservation's Farmland Mapping and Monitoring Program have established that the soils currently cultivated in Imperial County are productive and important farmland; the gross annual value of agricultural production has averaged close to one billion dollars over the past few years; and the County has taken a strong position towards maintaining and encouraging agricultural production, as reflected in the "Right-to-Farm" Ordinance.

## **b. Water Resources**

Water for irrigation in Imperial County is diverted from the Colorado River at the Palo Verde Diversion Dam north of Blythe by the Palo Verde Irrigation District, and at Imperial Dam through the All-American Canal headworks and desilting basins by the Imperial Irrigation District (IID) and the Bard Irrigation District for use in the Yuma, Bard, Imperial, and Coachella Valleys. In the Imperial Valley, approximately 2.9 million acre-feet of water is delivered annually to over 500,000 acres of agricultural lands via an elaborate gravity-flow system of about 5,600 water delivery points, 1,675 miles of canals and laterals (more than 1,000 miles of which are concrete-lined) and six regulatory reservoirs. The IID also maintains a 1,457-mile drainage system, which collects surface runoff and subsurface drainage from 32,222 miles of tile drains. For more information on the water transportation system, see the Water Element.

Irrigation is critical for crop production in Imperial County. Most basically, irrigation permits farmers to apply measured amounts of water to particular crops as required. The water delivery system is sophisticated enough such that next-day water orders can normally be accommodated when necessary. Although some crops are affected by salinity, extreme temperatures, and other environmental factors, the existing water delivery system overcomes the lack of precipitation in this otherwise arid region as a significant limiting factor to intensive crop production. Detailed information on the water delivery systems is available from the IID, the Palo Verde Irrigation District, and the Bard Irrigation District.

## **2. Livestock Production**

Livestock production, or animal husbandry, represents the second major form of agricultural production in Imperial County. Livestock production focuses on the production of beef cattle, sheep, wool, dairy products, swine, and, more recently, fish and other aquatic products. Horses are also used for work and pleasure. Imperial County offers many advantages to livestock producers. Locally grown crops provide a variety of feed ingredients for beef cattle, dairy cattle, sheep, and other animals, and adequate supplies of clean, fresh water are available from the water delivery





systems described above. Although hot in the summer, the climate is dry and mild in winter, making feeding conditions ideal for cattle and sheep.

As indicated in Table 1, the annual gross income from livestock production in the County ranged between 177 and 264 million dollars from 1977 to 1991, thereby typically representing 20-25% of the total agricultural gross income. Within the general category of livestock production, beef cattle represent the single most important product to date. Indeed, taking into account all agricultural products, cattle has long been the highest ranked million dollar product (surpassed only in 1988 by lettuce as the top performer; see Figure 3 and annual issues of the Imperial County *Agricultural Crop & Livestock Report* by the Agricultural Commissioner).

Cattle production therefore represents a major role in the County's economy by providing income, tax revenue, employment and the purchase of local goods and services. Feedyards use many crops grown by Imperial County farmers including alfalfa, bermuda hay, bermuda straw, oat hay, Sudangrass hay, ryegrass hay and wheat straw.

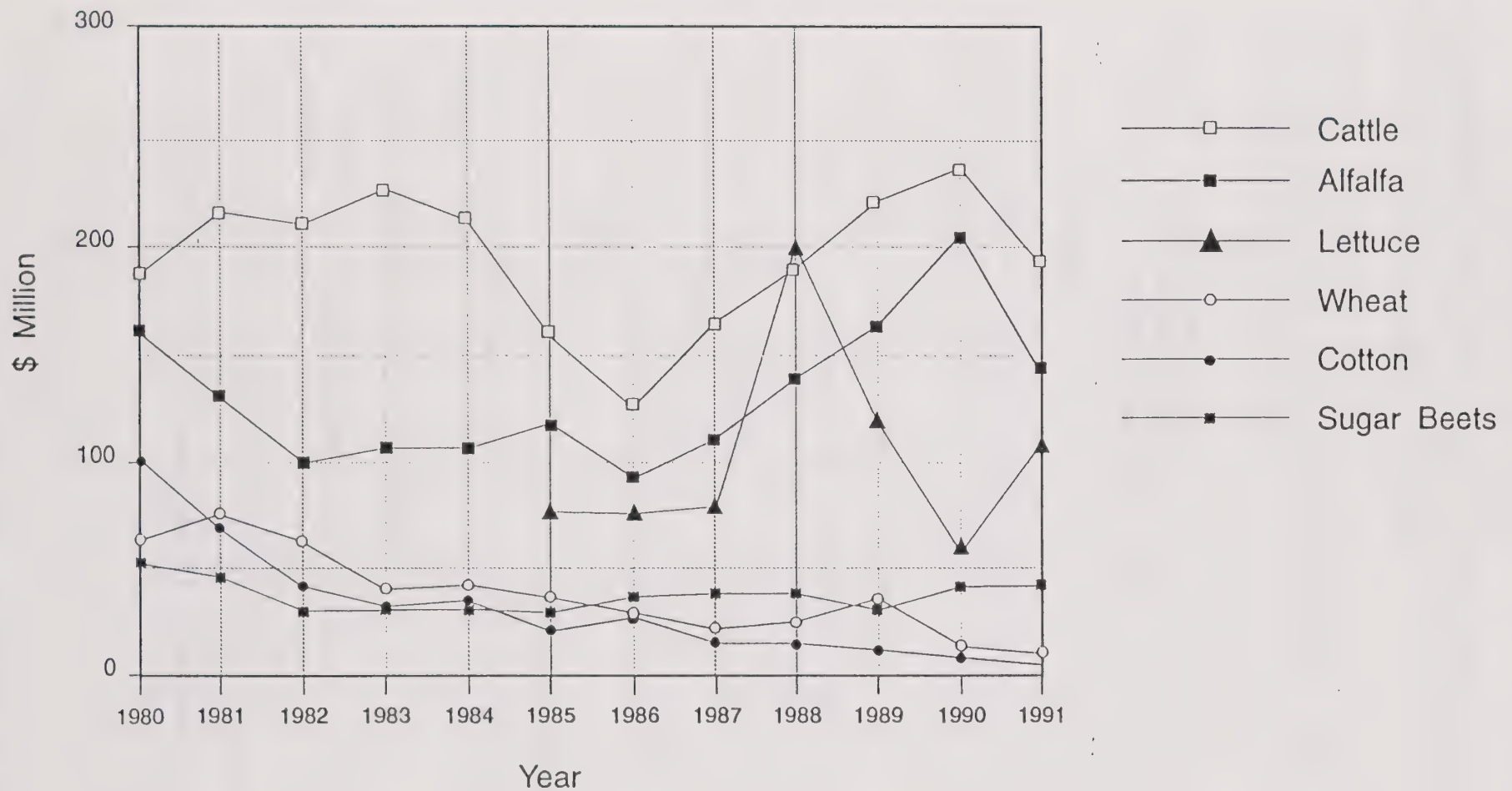
It is noteworthy that alfalfa has typically been the second highest million dollar product in Imperial County; a considerable portion of this field crop is consumed by locally raised livestock. Winter grazing of these crops in recently harvested fields is also important to cattle production and farmers alike, as are sugar beet tops which are grazed by cattle from April to July. Several crop culls including melons and carrots are also fed to cattle, and locally produced beet pulp and molasses are used in feedyards; lower quality roughages that do not meet nutrient requirements for dairy cattle or retail markets are suitable for use in feedyard rations. In addition, wheat and other locally grown grains are sold to cattle feeders when export or domestic markets are unfavorable, giving the farmers an alternative market for these crops.

Dairy cattle also represent a significant agricultural product in Imperial County, although the number of dairies has declined recently. Sheep are an important commodity, particularly in the winter when other regions throughout the West are unsuitably cold. The value of sheep was 7.3 million dollars in both 1985 and 1991, although it sunk to a low of 4.7 million dollars in 1986.

Aquaculture, which involves the controlled growing of phytoplankton, zooplankton, aquatic invertebrates, as well as "higher" aquatic plants and animals in marine, brackish, or fresh water, has increased rapidly over the past decade as a significant form of agriculture in Imperial County. Aquaculture products include fish, especially, and also fiber, pharmaceuticals, and chemicals. Aquaculture uses a variety of systems including ponds, raceways, silos, circular tanks, cages, and recirculating systems to grow fish, plants and animals.

Aquaculture is attracted to Imperial County because of a long growing season made possible by bright sunshine and cloudless days, and the abundant water supply offered by the Colorado River. Also available are heavy clay soils for pond construction, compatible uses of adjoining lands, relatively low cost flat land, relatively low cost electricity, and direct heat use of the County's geothermal resources. The proximity of this area to Los Angeles County, Orange County, and San Diego County markets is an additional advantage in locating here. Although not currently exploited,







two other important resources may, in the future, prove attractive for aquaculturalists: water from the Salton Sea (although this may be limited due to the current high levels of salts and toxic elements) and carbon dioxide trapped in groundwater.

Aquatic products in Imperial County had a gross annual value of 8.6 million dollars in 1991, representing a steady increase in gross income from 2.6 million dollars in 1985. According to a report published by the Economic Research Service of USDA, aquaculture is the fastest growing segment of the overall agriculture industry.

High population areas in Southern California, Baja California and Arizona give livestock producers in Imperial County a market unmatched in other areas in the country; and rail access to the Port of Los Angeles provides convenient access to international markets.

#### **D. Trends and Issues**

Several important trends and/or issues related to future agricultural production in Imperial County have developed recently and are addressed in this Agricultural Element. These trends and issues may be summarized as follows:

- The loss of important farmland to urban and other uses.
- An increase in "leapfrogging" or "checkerboard" patterns of residential and other development on agricultural land outside of existing urban boundaries.
- The increased difficulty of cultivating crops and raising livestock in areas experiencing urban development or population increases.
- Water conservation and transfer programs and the future availability of adequate quantities of irrigation water.
- Agricultural production and salinity/selenium levels in the Salton Sea.
- Environmental issues related to the runoff of agricultural chemicals and toxic elements in drainage water.
- Increased regulation on agricultural operations.
- A lack of understanding by the general public of importance of agricultural production and operations.
- Economic implications of the North American Free Trade Agreement (NAFTA).
- The need for increased local agricultural packaging/processing activities.





- Infestation by the Sweet Potato Whitefly Strain B (Silverleaf).
- Decline of the cattle and dairy industries.
- Special needs and difficulties of the aquaculture industry.

These trends and issues are reviewed below, and establish the context for presentation of the Goals and Objectives in following chapter.

### **Loss of Important Farmland to Urban and Other Uses**

As indicated in the Land Use Element, the estimated total population for Imperial County increased from 109,303 in 1990 to 117,421 in 1992. Projections of population and household numbers by the Southern California Association of Governments (SCAG) in 1992 estimated that Imperial County will have 140,100 people (and an additional 5,110 households) in year 1999. These projections by SCAG may prove to be low, however, in view of several factors including the rapid population growth that the County appears to be experiencing, the relative affordability of local housing, completion of the new prisons, the proposed new border crossing, and the proposed North American Free Trade Agreement. In 1991, the State Department of Finance had estimated the year 2000 population would range from approximately 143,400 to 184,700, with the "most likely" projection being 164,115.

It must be recognized that the County's population may increase significantly over the next decade or two. New households will need places to live and cities and unincorporated areas will need to grow. These observations are relevant to future agricultural production since, with few exceptions, virtually all land surrounding cities and unincorporated communities is important farmland. More specifically, most land that surrounds existing urban uses is "Prime Farmland" or "Farmland of Statewide Importance", as defined by the California State Department of Conservation. Indeed, these two important categories comprise approximately 95% of all agricultural land in the County.

Recognizing that population growth will occur, it is obvious that there will be some net losses of existing important farmland. Important agricultural lands are already under extreme pressure for urbanization in several areas, particularly in the vicinities of El Centro, Imperial, and Calexico. Since the County's economy has historically been dependent upon agricultural production, and this dependency will exist in the foreseeable future, the permanent conversion of significant amounts of important farmland to non-agricultural uses will negatively impact the local economy and the County's ability to provide important agricultural products to the nation and elsewhere.

### **Leapfrogging Patterns of Non-Agricultural Developments in Agricultural Areas**

Leapfrogging or "checkerboard" patterns of development occur when new subdivisions and other land uses are constructed in the midst of agricultural land near a city or rural community. Agricultural fields typically become bounded by new residential or urban land uses, and often become isolated as they are cut off from existing farmland. This isolation or stranding of fields leads to several major problems relating to agricultural operations including irrigation, the application of



pesticides and other chemicals by aerial spraying and other means, and access by tractors, trucks and other farm equipment. Eventually, these fields become too small or circumscribed by other land uses to be economically or conveniently farmed.

Leapfrogging has increased in the past few years and is a major concern of farmers. Agricultural uses of the type practiced in Imperial County, as opposed to "gentry farming" common in other Southern California communities, are not compatible with residential uses. When a leapfrog residential development is allowed to occur, this inherent incompatibility creates land use conflicts on all four sides of the new development. Inevitably, farming loses out and residential expands to create new boundaries of conflict.

During interviews conducted for the preparation of this Element, farmers, agricultural advisors, and others from the agricultural community invariably identified leapfrogging as a significant recent trend and major threat to agricultural production. Statements such as "keep the houses near the towns," "don't let people just develop houses or whatever in the middle of agricultural areas," and "growth should happen in an organized way, like spreading out around existing towns," are standard opinions. The consensus is that leapfrogging disrupts agricultural operations and reduces agricultural productivity significantly more than would be the case by expanding out from existing non-agricultural uses.

### **Difficulty of Cultivating Crops and Raising Livestock Near Urban Development**

Any new growth beyond existing urban limits, especially including leapfrogging developments, but also well-planned expansions at the boundaries of existing urban limits, introduces new land use conflicts. Normal agricultural operations are disrupted where non-agricultural land uses extend into or alongside areas that previously were entirely agricultural. Aerial spraying, for example, is a standard and efficient pest control practice for the production of many crops in Imperial County. Interruptions or restrictions of this practice, alone, threaten the economic viability of producing certain crops.

As another example of land use incompatibility, new developments commonly impact well-established irrigation practices by requiring that farmers construct new canals to route water around such developments and to create new drainage systems. Since the irrigation and drainage of farmland is based entirely on gravity flow, any new development in existing agricultural land poses potential difficulties for farming adjacent farmland, particularly on the downstream side.

Another important difficulty imposed upon farmers by increased development is the transportation of farm equipment. Most farmers in Imperial County cultivate fields in different locations, and must move various tractors, planters, cultivators, harvesters, landplanes, and other equipment, most of which is oversized, from area to area within the County. With increased growth, and particularly with increased linear development between existing urban uses, the transportation of machinery has become increasingly difficult and dangerous.





From another perspective, increased growth leads to increased nuisance complaints about farm and livestock production operations. The inhabitants of new subdivisions, in particular, are often from non-agricultural areas and not accustomed to the activities, sounds, dust, night lights, and odors associated with farmland, feedlots, dairies, and other agricultural operations.

The establishment of "buffer zones" between agricultural and urban areas would reduce much of the incompatibility between these land uses. The use of buffer zones to date, however, has not been common or especially effective. The buffer zones that exist often become overgrown with weeds, which attract various insects and other pests, or depositories for trash, making them aesthetically unpleasing.

The recently adopted Right-To-Farm Ordinance (Appendix B) goes far towards protecting the ability of agriculturalists to perform normal farm and livestock operations. By supporting agriculturalists and clarifying the circumstances under which agricultural operations may be considered a nuisance, this ordinance should help reduce losses to the County of its agricultural resources. Nevertheless, it is likely that future "nuisance" complaints and other difficulties of farming and raising livestock related to urbanization will force or encourage some agriculturalists to cease or curtail their operations. Such actions may discourage investments in farm improvements to the detriment of the County's agricultural industry as a whole.

### **Water Conservation and Water Transfer Programs**

As described previously, the IID provides approximately 2.6 million acre-feet of water to Imperial County each year, and other districts provide water to irrigate some 24,000 acres in the Bard and Palo Verde Valleys. Approximately 98% of the water delivered to the County is for irrigation. Considering that the Metropolitan Water District of Southern California (MWD) supplies about 2.6 million acre-feet of water each year to some 15 million people in 27 member agencies stretching from San Diego to Ventura, water conservation in Imperial County has become a critical issue. The issue has intensified in view of California's sixth consecutive year of drought and increased demands of Colorado River water from Arizona and Nevada.

Under a Water Conservation Agreement between IID and MWD reached in December 1989, MWD is financing the construction, operation, and maintenance of selected conservation projects at a cost of \$233 million, and in exchange can divert additional water from the Colorado River for delivery to its service area, equivalent to the amount conserved by IID. The 35-year contract between the districts commenced in 1990 and calls for construction to be completed in 1995. The program calls for 18 structural and non-structural conservation projects which can be grouped into seven categories: canal concrete lining, regulatory reservoirs, 12-hour deliveries, non-leak gates, system automation, lateral interceptors, and on-farm irrigation water management. By the end of 1991, an estimated 33,929 acre-feet of water was being conserved annually; the entire program is expected to conserve 106,110 acre-feet of water annually by 1994 in the County, and make it available for use by the MWD.



Water conservation measures that have the most potential to directly affect agricultural production are the on-farm irrigation projects. These proposed on-farm projects include the installation of tailwater pumpback and drip systems, farmer training of new irrigation techniques, reduction of alfalfa irrigation, and voluntary land fallowing. The proposed modified alfalfa irrigation program may involve non-irrigation for 75 consecutive days with incentives paid to participants. A voluntary land fallowing program involving subsidies may also be made available to farmers.

Many farmers currently find these irrigation reduction programs attractive, considering especially the facts that alfalfa prices are low and alfalfa damage by the whitefly is high. Whitefly damage, alone, has recently encouraged most farmers to dry out their alfalfa fields. It must be noted that although the agricultural community supported the IID/MWD water conservation/transfer program, many farmers are concerned that the initiation of irrigation reduction projects may lead to trends or policies that restrict the future availability of water for alfalfa and other crops. Non-voluntary irrigation reduction policies would be regarded as a potential threat to long-term agricultural production and the County's economy. The County is extremely concerned over the incremental effects of some of the programs initiated by IID and beyond authority of the County Board of Supervisors.

### **Agricultural Production and Salinity/Selenium Runoff**

Colorado River water is naturally somewhat saline, as are the soils that were deposited in Imperial Valley by thousands of years of periodic flooding. Since the flood of the Colorado River in 1905-1906, the Sea has been sustained by agricultural drainage from the Imperial, Coachella, and Mexicali Valleys, as well as from rainfall, storm runoff from the surrounding mountains, and groundwater inflow.

Agricultural production was adversely affected by high salt levels in the first half of the 1900s. This hazard has been overcome by the installation of subsurface tile drains. To date, about 32,222 miles of tile drains have been installed and drain most irrigated land in Imperial Valley. The drainage system has reduced previously existing soil salinity levels and prevents salt accumulation in farmland from irrigation water. A consequence of tile drains, however, is that, since 1949 more salt has been carried by drainage water to the Salton Sea than has been brought in by irrigation water.

Because the Salton Sea is a terminal sea, with no outlet except for evaporation, all salts that drain from agricultural lands of the lower Colorado River and Mexico are deposited there. A result of being a terminus for Colorado River water is that approximately five million tons of salt per year are carried into the Salton Sea. The high evaporation rate of the desert climate removes water from the Sea each year, but leaves the salt behind to become more and more concentrated. The salinity level of the Salton Sea is currently more than 43,000 ppm, which exceeds the salinity of ocean water (about 35,000 ppm), and the Salton Sea's sportfishing industry is threatened by rising salinity levels.

Another problem facing the Salton Sea is that of selenium. Studies have shown that the selenium entering the Sea is originally from the Colorado River, which contains approximately one to two parts per billion (ppb) of selenium. As water passes through Imperial Valley, the selenium becomes





concentrated due to the evapotranspiration that occurs during irrigation. The agricultural drains then carry this selenium-enriched water into the Salton Sea where it is taken up and concentrated by small organisms, which in turn are eaten by larger organisms. This process increases selenium concentrations. Fish in the Salton Sea have an average concentration of approximately ten ppb. Birds that feed off these fish have tissue levels of up to 40 ppb. This has a potential to cause health problems in birds.

Environmental concerns related to increased salinity and selenium levels of the Salton Sea have implications for future agricultural production practices. While irrigation water contributes additional salt and selenium to the Sea, the drainage water also prevents the Sea's existing levels of these substances from becoming even more concentrated by providing dilution. The solution to increased salinity and selenium levels is not simply to reduce irrigation water, since this would actually be accompanied by a rise in salinity and selenium concentrations. Nevertheless, it behooves the agricultural community to remain sensitive to and cooperate with environmental efforts to stabilize salinity and selenium of the Salton Sea.

### **Agricultural Chemicals and Environmental Issues**

Similar to the problems of high salinity and selenium levels of drainage water, several water quality and environmental issues are related to the runoff of agricultural chemicals. The intensive agricultural production of Imperial County necessarily results in the introduction of agricultural chemicals from pesticides and fertilizers into downstream waters. Studies performed by the California Regional Water Quality Control Board and the U.S. Geological Survey indicate that drainage water in the Imperial Valley contains pesticides in quantities that often exceed the Environmental Protection Agency's criteria for protection of fish and wildlife. The concentration levels of these chemicals in the fish and birds of the agricultural drains and the New and Alamo Rivers are higher than the levels found in Salton Sea fish and wildlife by several factors; this problem is currently being studied by the U.S. Department of Fish and Wildlife. It must be noted that a considerable portion of the pesticide and other contamination of New and Alamo Rivers and Salton Sea comes from irrigation drainage, industrial, and municipal waste discharges in Mexico.

The agricultural community needs to be concerned with environmental issues related to downstream water quality. The implementation of Integrated Pest Management (IPM) policies and programs that focus on long-term prevention or suppression of pest problems with minimum impact on human health, the environment, and nontarget organisms would go far towards reducing the environmental problems associated with pesticides and other toxic chemicals.

### **Regulations on Agricultural Operations**

A significant trend over the last few decades has been increased regulation on agricultural operations. Environmental, safety, and other restrictions on pesticide and fertilizer use, pest management, feedlot and dairy wastes, irrigation water and runoff drainage, aerial spraying, crop residue burning, slow-moving farm vehicles and operators' licenses, and other activities have made farming and livestock production extremely complex and arduous.





Although many such regulations are necessary for the long-term well-being of our health and environment, many farmers and cattle producers feel they are being regulated out of existence. Considerable time and effort is currently spent obtaining various non-land use related permits and licenses and meeting other regulatory obligations. In view of the many concerns relating to the use of chemicals, drainage water quality and the Salton Sea, increased population and traffic in the County, etc., more regulations will likely be implemented. Many potential constraints of farming activities deemed to be nuisances by nonfarm residents in rural areas, have likely been avoided by adoption of the Right-To-Farm Ordinance; but it is clear that strict new Federal, State, or County regulations could threaten the viability of agricultural production in Imperial County.

The agricultural community needs to anticipate and take the lead on environmental protections before governments do it for them. For instance, the increased adoption of Integrated Pest Management for pest control would go far towards simultaneously reducing environmental impacts and fending off new regulations. At the same time, agricultural researchers must continue to focus on the development of other ecologically-sound agricultural practices for Imperial County, and the various levels of government must balance the approval of new regulations with the ability of farmers, cattlemen, and other agriculturalists to stay in business.

### **Agricultural Operations and the General Public**

As the population of Imperial County has increased, the overall general public's understanding of the importance of agricultural production and operations has declined. More urban dwellers mean a widened communication gap between agriculturalists and non-agricultural consumers. Whereas long-time County residents understand or are accustomed to the odors, dust, noises, insects, and other conditions of living in an agricultural community, many new residents feel no loyalty to agriculture and simply find agricultural operations to be annoying. As the County's population increases in the future, this lack of education on the part of the general population about agricultural operations could lead to political implications detrimental to the agricultural industry, despite the adoption of policies such as the Right-To-Farm Ordinance.

The general public therefore needs information about the importance of agricultural operations. Public attitudes about the use of pesticides, the use of large quantities of water for irrigation, the economic benefits of raising cattle, the need to transport oversized machinery, and other concerns can be improved through education. The general public needs to appreciate what goes into putting food on the table, and needs to understand that the County's entire economy depends on agriculture. Some education in the County is occurring, such as the Farm Bureau's "Ag in the Classroom" program, but the local agricultural community needs to intensify such efforts. Several other counties in California, as well as the states of Arizona and Nevada, have established educational programs that would serve as excellent models for Imperial County.

### **The North American Free Trade Agreement**

The proposed North American Free Trade Agreement (NAFTA) holds important production and economic implications for Imperial County agriculturalists, although most such implications are still



poorly understood. The opinions of County farmers, researchers and others of the agricultural community about NAFTA are presently varied but generally positive and leaning towards cautious optimism. If NAFTA is approved by the U.S., Mexico, and Canada, the pact will eliminate trade barriers and topple political hurdles in creating the world's largest trading bloc worth \$6 trillion.

USDA economists are analyzing the expected effects of NAFTA on a commodity by commodity basis. Agricultural products anticipated to improve for Imperial County growers include meat and dairy products, wheat, cotton, and nuts; other products expected to be exported to Mexico include sweet corn, green beans, rice, tomato paste, and frozen asparagus. Crops that may be imported from Mexico in greater amounts, and which may increase competition for local growers, include melons, fresh tomatoes, bell peppers, cucumbers, fresh and frozen broccoli, and asparagus. Imperial County can remain competitive in the arena of vegetable and fruit production if these imported products are required to meet the same California State minimum quality standards that County-grown produce must meet.

The profitability of producing certain commodities will improve under NAFTA, and will decline for others. The advantages and disadvantages of growing specific crops will continue to evolve well after NAFTA is adopted, as production costs increase or decrease for Imperial County farmers, and as Mexican incomes and purchasing power for U.S. products increase. It is essential that the short- and long-term economic implications of NAFTA be analyzed and, to the extent possible, predicted in order that local agriculturalists be well-positioned to appropriately adapt their production strategies.

### **Agricultural Packaging and Processing**

The packaging and processing of agricultural products in Imperial County have declined in many ways since the 1950s, and yet these activities potentially represent highly valuable enterprises. The need for a more diversified economic base is reflected in the County's attempt to attract industries, such as General Dynamics, and the establishment of proposed industrial and commercial Specific Plan Areas (SPAs) such as the Mesquite Lake SPA, East Border Crossing SPA, and the I-8 and Highway 111 SPA (see Land Use Element).

Because Imperial County produces over 120 crops, of which dozens are multi-million dollar products, the potential benefits of developing agricultural packaging and processing operations are immense. Local packaging and processing operations would stabilize and increase the value of farm products; increase local employment; diversify the overall agricultural industry and thereby stabilize the local economy; and lower the prices of many locally produced commodities for local consumption.

Holly Sugar manufactures sugar from locally-raised sugar beets and is one of few agricultural processors in the County that could serve as a model for other commodities. Holly Sugar contracts with farmers to grow sugar beets, on about 40,000 acres, which are purchased by the factory at a stable price. The guaranteed purchase of sugar beets by this plant at a market price adds considerable security to the production of this crop that would not be possible otherwise. The Holly





Sugar plant also employs over 325 people from April through August and approximately 100 individuals during the remainder of the year, and contributes revenue to the County's economy.

Products that may be immediately amenable to advanced packaging and processing steps include carrots, tomatoes, cole crops, onions, Bermuda grass seed, and citrus, to name a few. At present, most carrots are harvested, topped, washed, and exported out of the County in large trucks to be packaged elsewhere for the retail market. Local packaging of carrots would increase the value of this product; the production of carrot juice and other carrot products would increase this crop's value even further.

Similarly, local tomato processors could can, dry, and juice tomatoes, and thereby contribute benefits to the local economy, as could citrus juice plants, onion processing plants, seed mills, and a variety of fresh and frozen vegetable packaging operations. Research and marketing studies would likely identify several commodities that, if packaged and processed locally, would contribute to the benefits described above.

### **White Fly Infestation**

The County is currently contending with a natural disaster in the form of the Sweet Potato Whitefly Strain B (Silverleaf). In 1991, the whitefly wiped out 99% of Imperial Valley's fall melon crop, and inflicted severe damage to the winter vegetables including lettuce, broccoli, and cauliflower. Alfalfa was also severely damaged. In all, Imperial Valley growers suffered an estimated \$130 million crop damage between May 1991 and May 1992, about 2,500 farmworkers were forced into unemployment, and local businesses felt the sting of economic hardship. In November 1991, Governor Pete Wilson proclaimed a state of emergency in Imperial and Riverside Counties to assist farmers and researchers in finding a solution to the devastating pest.

The Imperial County Whitefly Management Committee was established in September 1991 to determine goals and coordinate research efforts to help eradicate this insect. The committee coordinates the efforts of the County Agricultural Commissioner, local farmers, IID, Palo Verde Irrigation District, Coachella Valley Water District, University of California Cooperative Agricultural Extension, United States Department of Agriculture, and other agencies. An aggressive funding effort has been undertaken to provide operating capital and research funds. Research efforts to date have focused on plant management techniques and other agricultural practices (e.g., shortened alfalfa cutting cycles and summer drying, delayed early plantings of alfalfa, sugar beets, and winter vegetables, etc.), biological controls, and pesticide and fertilizer effects. Continued research funding is critical to combat this and other agricultural pests.

### **Decline of the Cattle and Dairy Industries**

A significant trend has been a decline of cattle feeding from a peak of 450,000 animals in the early 1970's to about 200,000 in 1992, contributing a negative impact on the local agricultural economy. The major reasons for this decline include increased marketing costs, competition from other regions, and State regulations. These trends may be summarized as follows.



**Marketing.** New beef processing and packaging techniques have led to increased costs of these operations in California and a decline in processing facilities. No beef packers currently remain in Imperial County, and the number of major packers in the southern California and Arizona region has declined from more than 20 in the 1960s and 1970s to only four at present. Some finished cattle are transported to more distant areas for processing, but this option entails additional marketing costs. It is noteworthy that Mexico is becoming an important market for local cattle, and a potential exists for new, modern processing facilities being developed in Mexico that would not be feasible in California.

**Competitiveness.** Although the price of alfalfa is currently low, the cost of feed in Imperial County in recent years has been high compared with the cattle industry of the High Plains. One consequence of this is that Imperial County cattle yards focus on raising calves, since calves are best raised in feedyard designs. While this practice helps keep local occupancy up, the profitability is not as high as raising yearlings until finished. Furthermore, light crossbred calves (e.g., Hereford/Brahman, Angus/Brahman, etc.), which gain weight fast, have become limited in availability to Imperial County and thus more costly to purchase. As a consequence, relatively more Holstein calves are raised now than 15 years ago. Holstein calves are cheaper to purchase but gain weight relatively slowly and command lower market prices when sold as heifers or steers.

**California Business Environment.** Increased regulations, increased requirements for permits and licenses, and increased costs such as labor, worker's compensation insurance, energy, taxes, and user fees have made it more difficult and less productive to raise cattle in California compared with other regions. Several products that are prohibited or restricted in California, such as cotton foodstuffs and parasitical compounds, are available in other areas such as Arizona, often resulting in lower production costs out of the State. Permitting processes for building and/or additions in California are more onerous than in most other states; air pollution standards have led to higher dust control expenses; a higher population in the County has added to dust and odor control difficulties, especially for those operating close to urban areas; and increased traffic has made the herding of pasture cattle more difficult. Finally, livestock producers face legislation on animal welfare that can be devastating.

It is noteworthy that any additional decline of the cattle industry in Imperial County would further exacerbate the viability of alfalfa, which currently is produced on approximately 37% of all County agricultural land. Alfalfa is already experiencing low prices and high transportation costs, largely due to the need to ship a major portion out of the County.

If the above obstacles could be overcome, Imperial County has the land, labor, climate, technology, and other resources for attracting and developing profitable cattle and dairy operations (see Dairy Expansion Committee of Imperial County report, *Desert Dairying in the Imperial Valley*). These operations would have a side benefit of improving and stabilizing the local alfalfa industry.





## **Special Needs and Difficulties of the Aquaculture Industry**

Aquaculture facilities impound water and grow aquatic plants and animals under intensive and very controlled conditions. Some facilities are most efficiently or economically operated as integrated production, processing and warehouse operations. As noted previously, Imperial County aquaculture production and sales have recently increased to the extent that this is one of the fastest growing industries in the County. Growth of the industry has also resulted in the identification of several special requirements and difficulties.

As with any new industry, the availability of financing to develop and expand aquatic operations is often critical to aquaculturalists. Aquaculturalists need freedom to develop their private resources and to expand and modify their operations as needed. Financing by agencies such as the Federal Land Bank, Production Credit Association, and Farmers Home Administration also needs to be facilitated. These agencies are empowered to make aquaculture loans, but have been reluctant to do so in Imperial County due to unfamiliarity with the industry and the perception that it lies outside of mainstream agriculture.

Aquaculturalists also need the capability to select facility designs, materials, and construction methods best suited for production sites and for culturing organisms. Because aquaculture operations require 24 hours-a-day monitoring and cultivation activities, on-site housing is often needed for employees and their families.

Potential problems exist with water impoundment. If water is ponded on land that has a high filtration rate, seepage may raise the water table on surrounding properties. However, legal remedies are available to neighboring landowners to force sealing of the leak or abandonment of the pond. New water facilities also contribute to the risk of drowning. But the exposure to drowning at aquaculture facilities will remain quite small compared with the numerous other water impoundments in the County such as canals and lakes.

Fish are often perceived as having a bad odor. Bad odor is not an inherent quality of fish or of aquaculture facilities, but result from poor water quality and improper operations. The continued availability of clean, fresh water and the proper management of cultivation facilities will ensure the successful and sanitary production of high quality products desired by the marketplace.

Aquatic organisms are very sensitive to certain pesticides. Pesticides carried to aquaculture facilities by canal water or that drift from aerial spraying may threaten cultured aquatic organisms. The agricultural community needs to be aware of this problem and assist, through education programs, in avoiding potential conflicts.

Mosquitoes and other aquatic insects are often perceived by the public as a problem associated with aquaculture facilities. This is seldom a problem, however, since fish and water movement tend to control mosquito larvae. If problems arise, they are usually associated with water in drainage ditches or seepage containment structures. Insects can be controlled in these waters by stocking fish that eat mosquito larvae or by adding chemicals to the water. Aquaculture facilities may therefore require





the use of pesticides, drugs, or chemicals, but they generally use less than other agricultural endeavors.

Aquaculture facilities attract waterfowl and other wildlife, most of which are welcomed. Fish-eating birds are an exception; they transmit fish diseases in addition to eating and damaging fish. The depredation problem of migratory waterfowl has increased in recent years and is unlikely to change significantly in the near future. The problem of depredating wildlife is not unique to aquaculture; similar problems are experienced by farmers, ranchers, and pet owners. The Department of Fish and Game regulations permit farmers and ranchers to harass and drive away wildlife that damage crops. In cases where harassment is unsuccessful and exclusionary devices are impractical, Federal regulations provide for the issuance of permits by the U.S. Fish and Wildlife Service to take depredating migratory waterfowl. Many public agencies and private companies are conducting research into better ways to solve the problem of depredating wildlife.



### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Agricultural Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing development policies for agricultural land use in Imperial County. This Chapter of the Agricultural Element presents Imperial County's Goals and Objectives relative to agricultural production within the unincorporated areas of the County. Some Goals and Objectives have been taken from other Elements of the previous General Plan (i.e., Land Use, Housing, and Open Space/Conservation) that relate to agriculture. Several new Goals and Objectives have been added based upon existing conditions of the industry and the many important trends and issues described in Chapter II.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. The Goals and Objectives, therefore, are important guidelines for agricultural land use decision making. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Preservation of Important Farmland**

Goal 1: All Important Farmland, including the categories of Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance, as defined by Federal and State agencies, should be reserved for agricultural uses.

Objective 1.1 Maintain existing agricultural land uses outside of urbanizing areas and allow only those land uses in agricultural areas that are compatible with agricultural activities.

Objective 1.2 Encourage the continuation of irrigation agriculture on Important Farmland.

Objective 1.3 Conserve Important Farmland for continued farm related (non-urban) use and development while ensuring its proper management and use.

Objective 1.4 Discourage the location of development adjacent to productive agricultural lands.





Objective 1.5 Direct development to less valuable farmland (i.e., Unique Farmland and Farmland of Local Importance rather than Prime Farmland or Farmland of Statewide Importance) when conversion of agricultural land is justified.

Objective 1.6 Recognize and preserve unincorporated areas of the County, outside of city sphere of influence areas, for irrigation agriculture, livestock production, aquaculture, and other special uses.

Objective 1.7 Provide policies and/or incentives for continued use of farmland located just beyond the urban boundaries to ensure the stability that enables farmers to invest and reinvest in agricultural production on their land.

Objective 1.8 Allow conversion of agricultural land to non-agricultural uses only where a clear and immediate need can be demonstrated, based on population projections and lack of other available land (including land within incorporated cities) for such non-agricultural uses. Such conversion shall also be allowed only where such uses have been identified for non-agricultural use in a city general plan or the County General Plan, and are supported by a study to show a lack of alternative sites.

Objective 1.9 Preserve major areas of Class II and III soils which are currently nonirrigated but which offer significant potential when water is made available.

Objective 1.10 Hazard-prone areas such as earthquake faults and aircraft impact zones should remain designated for agricultural uses.

Objective 1.11 Control and prevent soil erosion when possible.

Objective 1.12 Support conversion of State and Federal lands suitable for irrigation agriculture to private ownership and into agricultural production.

### **Development Patterns and Locations on Agricultural Land**

Goal 2: Adopt policies that prohibit "leapfrogging" or "checkerboard" patterns of non-agricultural development in agricultural areas and confine future urbanization to adopted Sphere of Influence areas.

Objective 2.1 Do not allow the placement of new non-agricultural land uses such that agricultural fields or parcels become isolated or more difficult to economically and conveniently farm.

Objective 2.2 Encourage the infilling of development in urban areas as an alternative to expanding urban boundaries.



Objective 2.3 Maintain agricultural lands in parcel size configurations that help assure that viable farming units are retained.

Objective 2.4 Discourage the parcelization of large holdings.

Objective 2.5 Merge or revert to acreage substandard lots in "paper subdivisions" under the same ownership and not being used as separate parcels. Such merging should be done only for agricultural reasons, not to facilitate residential development.

Objective 2.6 Discourage the development of new residential or other non-agricultural areas outside of city "spheres of influence" unless designated for non-agricultural use on the County General Plan, or for necessary public facilities.

Objective 2.7 Allow agricultural employee housing on Important Farmland for permanent and seasonal employees and their families where it promotes efficiency in farming operations and has a minimal impact on agricultural production.

### **Agricultural and Non-Agricultural Land Use Relations**

Goal 3: Limit the introduction of conflicting uses into farming areas, including residential development of existing parcels which may create the potential for conflict with continued agricultural use of adjacent property.

Objective 3.1 The primary use of any parcel designated "Agriculture" on the Land Use Plan shall be agricultural production. Residential uses in such areas must recognize that this primary use of the land may create nuisances such as flies, odors, dust, noise, night light, and chemical spraying.

Objective 3.2 Enforce the provisions of the Imperial County Right-to-Farm Ordinance (No. 1031).

Objective 3.3 Enforce the provisions of the State nuisance law (California Code Sub-Section 3482).

Objective 3.4 Maintain for the benefit of agricultural transportation use, routes which are essential to facilitate the transportation of farm products and oversized farm equipment through agricultural and non-agricultural areas. Continue to allow the driving of farm animals along rural transportation routes.

Objective 3.4a Identify busy agricultural roads to create special crossings for farm equipment.



Objective 3.5 As a general rule, utilize transitional land uses around urban areas as buffers from agricultural uses. Such buffers may include rural residential uses, industrial uses, recreation areas, roads, canals, and open space areas.

Objective 3.6 Where a development permit is sought adjacent to agricultural land use, protect agricultural operations by requiring appropriate buffer zones between agricultural land and new developments, and then keep these zones aesthetically pleasing and free of pests by cleaning them of all garbage and noxious vegetation. Vegetation for the purpose of dust control shall be planted and maintained in an attractive manner. The buffer shall occur on the parcel for which the development permit is sought and shall favor protection of the maximum amount of farmland.

Objective 3.7 Land use decisions regarding property contiguous to agricultural operations shall give consideration to creation of large parcel sizes to minimize conflicts with such operations.

## **Water Availability and Conservation**

Goal 4: Maximize the inherent productivity of Imperial County's agricultural resources by ensuring future availability of adequate and affordable irrigation water and by managing water such that it is used effectively and not wasted.

Objective 4.1 The County must favor efforts to ensure adequate irrigation water for agricultural areas.

Objective 4.2 Coordinate with the appropriate agencies for the availability of water to meet future agricultural needs.

Objective 4.3 The County will participate and encourage multi-agency participation in water projects where such coordination can improve the likelihood of maintaining an adequate long-term supply of irrigation water throughout the County.

Objective 4.4 Protest any development of non-voluntary water conservation legislation, which would risk removing land from production and impacting the local economy.

Objective 4.5 Encourage farmers to use irrigation methods that conserve water.

Objective 4.6 The County should participate with cities and districts to establish programs for the agricultural re-use of treated wastewater in manners that would be economically beneficial to agriculture.





## **Irrigation Runoff and Environmental Issues**

Goal 5: Improve the quality of irrigation water runoff and reduce the extensive use of pesticides and other chemicals to minimize impacts to downstream water bodies, wetland habitats, and the overall environment.

Objective 5.1 The County shall participate and encourage multi-agency participation in finding long-term solutions to reduce existing high levels of salt and selenium, originating from Colorado River water, in downstream drainage ditches and the Salton Sea.

Objective 5.2 The County shall participate and encourage multi-agency participation in developing strategies to reduce the use of pesticides and other chemicals without negatively impacting agricultural production; and thereby reduce the drainage of toxic elements into downstream drainage ditches and the Salton Sea.

Objective 5.3 Ensure the continued availability of the Salton Sea as a depository for irrigation runoff.

Objective 5.4 The County shall continue to work closely with University of California Cooperative Extension personnel, college horticultural or entomological faculty, pest control advisers, and other pest management specialists to develop Integrated Pest Management (IPM) as a pest management strategy that focuses on long-term prevention or suppression of insects, plant pathogens, weeds, rodents, and other pests with minimum impact on human health, the environment, and nontarget organisms.

Objective 5.5 Encourage uses of naturally occurring biological control; alternate plant species or varieties that resist pests; pesticides with a lower toxicity to humans or nontarget organisms; and irrigation, cultivation, and fertilizing practices that reduce pest problems.

Objective 5.6 Use broad spectrum pesticides only as a last resort when careful monitoring indicates they are needed according to preestablished guidelines. When treatments are necessary, the least toxic and most target-specific pesticides should be chosen.

Objective 5.7 The Agricultural Commissioner's Office shall continue to ensure that applicators of farm chemicals are educated regarding current pesticides and other chemicals, their hazards, and applications.

## **Agricultural Regulations**

Goal 6: Strive to prevent the adoption of inappropriate, unnecessary, and restricting Federal, State, and local regulations that threaten the ability of farmers and livestock producers to profitably produce food and fiber for the nation.



Objective 6.1 The County shall not adopt regulations that impact agricultural production unless they are justified on the basis of sound environmental concerns.

Objective 6.2 Assist farmers and livestock producers in their efforts to understand and abide by regulations and to process applications for permits and licenses.

Objective 6.3 Oppose programs and regulations that seek to dictate animal husbandry practices based on religious beliefs, emotions, or misconceptions rather than on scientific evidence.

### **Public Relations and Education**

Goal 7: Establish positive relations with the general public and inform the general public that the County's entire economy is intricately dependent upon agricultural production.

Objective 7.1 Develop and expand educational programs, such as the Farm Bureau's "Ag in the Classroom", to inform children and adults of the importance of protecting farmland.

Objective 7.2 Continue to make information accessible to the public regarding pesticides used and areas treated, as currently provided by the Agricultural Commissioner's Office.

Objective 7.3 Strive to minimize citizen complaints through public education.

Objective 7.4 Maintain existing procedures provided by the Agricultural Commissioner's Office and the Right To Farm Ordinance that allow for public input without disruption of agricultural operations.

### **Agricultural Production and Marketing Research**

Goal 8: Improve the financial viability of the agricultural sector of Imperial County's economy through actions that have the potential to improve yields and reduce costs.

Objective 8.1 The County shall work closely with and promote the research of the University of California Cooperative Extension; the U.S.D.A Agricultural Research Service; the Animal, Plant Health and Inspection Service; pest management experts, water management experts, and others to continuously develop and implement efficient state-of-the-art farm and livestock production strategies.

Objective 8.2 Promote marketing research at the regional level to monitor trends in the demands for particular commodities such that Imperial County agriculturalists may adjust production strategies in timely manners and thereby maintain a competitive edge in the marketplace.





Objective 8.3 Promote the consumption of locally produced commodities, such as vegetables, beef and dairy products, fish, fruits, nuts, and honey.

Objective 8.4 Continue to promote agricultural research on the expected effects upon commodities under the North American Free Trade Agreement (NAFTA) to provide a competitive edge to Imperial County agriculturalists.

Objective 8.5 The County shall support and encourage the efforts of the Imperial County Whitefly Management Committee to develop the most effective means of controlling this pest. The County shall support and promote similar efforts to eradicate, and/or formulate control strategies for, other new pests that may impact local agricultural production in the future.

Objective 8.6 Encourage the production of labor intensive crops such as vegetables.

### **Agricultural Packaging/Processing Operations**

Goal 9: Increase the value of locally produced agricultural commodities and improve and stabilize the County's economy by promoting local agricultural packaging and processing operations.

Objective 9.1 Allow agriculturally related commercial and industrial uses to be located in agricultural areas that would package, process, or market agricultural commodities produced in the area, provided that the conversion of these facilities to non-agricultural related uses is prohibited.

Objective 9.2 Encourage agricultural packaging/processing facilities in agricultural areas that would employ large numbers of workers.

Objective 9.3 Utilize the following guidelines to analyze the suitability of a proposed agricultural service use:

- it does not adversely affect agricultural production in the area;
- it supports local agricultural production;
- it is compatible with existing agricultural activities and residential uses in the area;
- it does not require the extension of sewer or water lines.

Objective 9.4 Allow and encourage on-farm product handling and selling operations.

Objective 9.5 Allow agricultural produce stands at appropriate locations in agricultural land use areas and Farmer's Markets to promote and market those agricultural products grown or processed in Imperial County.



## **Special Cattle and Dairy Concerns**

Goal 10: Encourage the continuation and expansion of cattle/dairy production on agricultural land.

Objective 10.1 Direct new residential and other urban development away from existing cattle and dairy operations.

Objective 10.2 Emphasize to the general public and to potential developers that the provisions of the Imperial County Right-To-Farm Ordinance (No. 1031) apply to livestock operations such as feedyards and dairies.

Objective 10.3 Allow cattle and dairy producers the ability to operate trucks and equipment, often oversized or overweight, on County roads that are increasingly impacted by more traffic.

Objective 10.4 Ensure the availability of clean, fresh water for cattle and dairy operations without unnecessary restrictions.

Objective 10.5 Support the existence and development of local beef processing operations.

Objective 10.6 Discourage the adoption of "nuisance" related regulation that restrict the ability of cattle and dairy operators to economically and conveniently produce these commodities.

## **Special Aquaculture Concerns**

Goal 11: Encourage the continuation and expansion of aquacultural production.

Objective 11.1 County zoning regulations should define aquaculture as an agricultural use subject to the same rights, provisions, and regulations as other agricultural uses.

Objective 11.2 Emphasize to the general public and to potential developers that the provisions of the Imperial County Right-To-Farm Ordinance (No. 1031) apply to aquaculture facilities.

Objective 11.3 Encourage development by aquaculturalists of privately owned resources such as land, water, and geothermal energy and other underground resources.

Objective 11.4 Allow labor housing on property utilized for aquacultural purposes subject to the same provisions and regulations as farm labor housing on land utilized for other agricultural purposes.



Objective 11.5 Allow on-site processing, packing, and warehousing of aquatic plants and animals at aquaculture producing facilities subject to the same provisions and regulations as those on land utilized for other agricultural purposes.

Objective 11.6 Continue to gather statistics on aquaculture production in the County and report them under the general category "aquaculture products" until production is sufficient to justify separate categories for various products.

### C. Relationship to Other General Plan Elements

State law mandates seven Plans or "Elements" for local government General Plans. Although the Agricultural Element is not mandatory, it must comply with requirements that are requisite to all parts within a General Plan. Legislative intent must be fulfilled as set forth in Government Code, Section 65300.5: "...the General Plan and the parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency."

The Agricultural Element Policy Matrix (Table 4) identifies the relationship between the Agricultural Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 4 AGRICULTURAL ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Open Space Conservation	Geothermal	Water
Agriculture Preservation	X				X	X		X
Land Use Planning	X	X	X			X		
Water Use								X
Environmental Issues	X					X		
Agricultural Production	X							
Cattle/Dairy	X		X					X
Aquaculture	X							X





## **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

### **A. Preface**

Imperial County has utilized its productive soils, access to water, climate, and other resources to develop into one of the most agriculturally productive regions in the world. Based on information developed for the Agricultural Element of the General plan, it is clear that the County can and should take additional steps to provide further protection for agricultural operations and at the same time provide for logical, organized growth of urban areas. This chapter summarizes the programs and policies that will be used to implement the Goals and Objectives identified in Chapter III.

The single most important action that Imperial County can take to protect agricultural land is to adopt a clear, well-constructed set of goals, objectives, and policies that protect the conversion of agricultural land to non-agricultural uses in the future. The County must be specific and consistent about which lands will be maintained for the production of food and fiber and for support of the County's economic base. Additional implementation measures may be adopted by the County in the future to further the Goals and Objectives identified in this Element.

The Planning Department shall prepare a report to the Planning Commission and Board of Supervisors regarding the use and implementation of the Agricultural Element within two years of the date of adoption. The Agricultural Element should be updated every five years thereafter.

### **B. Assumptions**

Based on current information and trends, County staff has made certain assumptions concerning the future. The following assumptions were utilized in the preparation of this Element:

- It is assumed that land suitable for irrigated agriculture is perhaps the most significant natural attribute of the County and its protection and enhancement is in the best interests of all County residents.
- It is assumed that the County's population size will grow significantly during the 1990s.
- It is assumed that the County's overall economy will be dependent upon agricultural production in the foreseeable future.
- It is assumed that residential, commercial, and urban pressures to expand into existing agricultural area will intensify, and that considerable non-agricultural land use projects will be proposed away from existing urban boundaries in the midst of Important Farmland.
- It is assumed that the agriculture industry will grow, provided that important resources such as productive soils and irrigation water are not significantly reduced and that new restrictive and unreasonable regulations are not placed upon agriculturalists.



- It is assumed that the general public can and will be educated about the continued importance of agriculture to the County's overall well-being.
- It is assumed that long-term environmental problems related to agricultural production, such as salt and selenium levels in the Salton Sea and the use of pesticides and other chemicals, will be reduced through effective projects to water quality in the Sea and through modified pest management strategies on the farm.
- It is assumed that additional agricultural packaging and processing operations would be beneficial to agriculturalists and the County as a whole.

### **C. Policies and Programs**

In order to implement the Goals and Objectives in the previous chapter, the County will adopt the following policies:

#### **1. Preservation of Important Farmland**

##### **Policy**

The overall economy of Imperial County is expected to be dependent upon the agricultural industry for the foreseeable future. As such, all agricultural land in Imperial County is considered as Important Farmland, as defined by Federal And State agencies, and should be reserved for agricultural uses. Agricultural land may be converted to non-agricultural uses only where a clear and immediate need can be demonstrated, such as requirements for urban housing, commercial facilities, or employment opportunities. All existing agricultural land will be preserved for irrigation agriculture, livestock production, aquaculture, and other agriculture-related uses except for non-agricultural uses identified in this General Plan or in previously adopted City General Plans.

##### **Programs**

- For a period of two years after adoption of this General Plan revision by the County Board of Supervisors, no land shall be removed from the Agriculture category except where needed for use by a public agency, for geothermal purposes, where a mapping error may have occurred, or where a clear long term economic benefit to the County can be demonstrated through the planning and environmental review process. The Board shall be required to prepare and make specific findings and circulate same for 60 days before granting final approval of any proposal which removes land from the Agriculture category. Upon completion of the two-year agricultural protection period, the Board of Supervisors shall review this program and consider instituting a second two-year protection period.





## **2. Development Patterns and Locations on Agricultural Land**

### **Policy**

"Leapfrogging" or "checkerboard" patterns of development have intensified recently and result in significant impacts to the efficient and economic production of adjacent agricultural land. It is a policy of the County that leapfrogging will not be allowed in the future. All new non-agricultural development will be confined to areas identified in this plan for such purposes or in Cities' adopted Spheres of Influence, where new development must adjoin existing urban uses. Non-agricultural residential, commercial, or industrial uses will only be permitted if they adjoin at least one side of an existing urban use, and only if they do not significantly impact the ability to economically and conveniently farm adjacent agricultural land.

### **Programs**

- All non-agricultural uses in any land use category shall be analyzed during the subdivision, zoning, and environmental impact review process for their potential impact on the movement of agricultural equipment and products on roads located in the Agriculture category, and for other existing agricultural conditions which might impact the project, such as noise, dust, or odors.
- The Planning Department shall review all proposed development projects to assure that any new residential or non-agricultural commercial uses located on agriculturally zoned land, except land designated as a Specific Plan Area, be adjoined on at least one entire property line to an area of existing urban uses. Developments which do not meet this criteria should not be approved.
- The Planning Department shall identify "paper subdivisions" in predominantly agricultural areas where common ownership could enable lot mergers or reversions to acreage to be done in order to reduce the potential for residential development.
- Establish and maintain County Zoning Ordinance requirements for a minimum lot size of 40 acres in land designated "Agriculture" on the Land Use Plan.

## **3. Agricultural and Non-Agricultural Land Use Relations**

### **Policy**

Any new growth increases the potential for new conflicts with existing agricultural land uses. It is the policy of the County that the burden for preventing or mitigating agricultural/non-agricultural land use conflicts falls on the developer of the non-agricultural land use.



## **Programs**

- Identify important transportation routes used by agriculturalists in non-agricultural areas and post signs warning drivers that these routes are frequently used to transport farm products and oversized farm equipment.
- The Planning Department shall post and maintain copies of the County's "Right-to-Farm" Ordinance at their public counter. All building permit applicants proposing non-agricultural uses on land zoned or designated for agriculture, shall be given a copy of the notice and sign a statement that they have received the copy.

## **4. Water Availability and Conservation**

### **Policy**

Agricultural production in Imperial County is dependent upon adequate and affordable irrigation water, and the County is committed to protect its access to this resource. The County is also committed to conserving water by promoting the development of structural and non-structural measures, including improved on-farm irrigation water management systems.

### **Programs**

- All subdivisions and discretionary projects which require the extension of water service in excess of that necessary for a single residence, shall include an analysis of water use impacts as part of the environmental review process. This shall include potential growth inducing impacts affecting continued agricultural uses in the vicinity of the project where appropriate.
- The County shall establish landscape plan review procedures for new development in order to regulate and encourage the economical use of domestic water resources through the promotion of drought resistant native and non-native desert landscaping in all types of urban development.

## **5. Irrigation Runoff and Environmental Issues**

### **Policy**

As a depository for irrigation runoff, the Salton Sea receives salt and selenium originating from the Colorado River, and pesticides and other chemicals originating from agricultural practices. The County is committed to seek effective and long-term solutions to agriculture-related environmental problems.



## **Programs**

- Form a working group comprised of the Regional Water Quality Control Board, Farm Bureau, Imperial Irrigation District, and County staff to study methods that would reduce the amount of contaminants transported into the Salton Sea.

## **6. Agricultural Regulations**

### **Policy**

The County recognizes that Federal, State, and local regulations have made it increasingly difficult for farmers and livestock producers to conveniently and profitably produce food and fiber, and is committed to oppose all new regulations that impact agricultural production, unless they are justified on the basis of sound environmental concerns.

### **Programs**

- The County shall monitor and comment on bills and regulations introduced in the State and Federal legislatures affecting agricultural lands. The Board of Supervisors shall transmit their position on such bills directly to the legislature or via Imperial County's local legislators.

## **7. Public Relations and Education**

### **Policy**

Positive relations between the agricultural industry and the general public are essential if agricultural production is to remain viable and expand. The County encourages the development of educational programs that teach children and adults about agricultural activities and about the importance of protecting farmland for the benefit of the nation's food supply and support of the local economy.

### **Programs**

- Provide County staff support for classroom educational programs, such as the Farm Bureau's "Ag in the Classroom", to inform children and adults of the importance of protecting farmland.
- Support the Mid-Winter Fair, Brawley Cattle Call, and other new community events and activities which remind local residents of the County's agricultural history at its economic importance. An example of a possible new event is a cattle or sheep "drive" followed by a picnic with games and exhibits.





## **8. Agricultural Production and Marketing Research**

### **Policy**

The County is committed to improve the financial viability of agricultural production through the improvement of agricultural yields and reduction of production costs. All research related to developing more efficient and productive agricultural strategies, and to contributing a marketing edge to County agriculturalists, is supported and encouraged.

### **Programs**

- Continue to support and encourage work by the U.C. Cooperative Extension to assure that local agriculturalists are kept up-to-date on the latest advances in agricultural production, product market trends, and other new information so that agricultural practices can adjust to market conditions and production strategies.

## **9. Agricultural Packaging/Processing Operations**

### **Policy**

The agricultural industry, and indeed the overall County economy, would benefit immensely from the development of new agricultural packaging and processing operations. The County will promote such development and will permit these operations to be located on Important Farmland if they are deemed to improve agricultural production as a whole, and if they are determined not to significantly impact production of surrounding agricultural land. The County will support this with the requirement that these facilities may not later be converted to non-agricultural uses.

### **Programs**

- Amend the County Zoning Ordinance to facilitate with appropriate restrictions the establishment of local facilities in agricultural areas to package, process, or market agricultural commodities produced in the area. Among the restrictions shall be a condition to prohibit the conversion of these facilities to non-agricultural uses.
- Amend the County Zoning Ordinance as needed to permit stands for the sale of locally grown or processed agricultural products in agricultural areas.

## **10. Special Cattle and Dairy Concerns**

### **Policy**

The County recognizes cattle and dairy production and integral components of the overall agricultural industry, and supports the continuation and expansion of these operations. All land uses that pertain to the protection of Important Farmland also apply to the cattle and dairy operations.



## **Programs**

- Include with all notices to the general public and to potential developers that the provisions of the County Right-To-Farm Ordinance apply to livestock operations such as feedyards and dairies.
- Amend the County Zoning Ordinance as needed to facilitate the local beef processing operations.

## **11. Special Aquaculture Concerns**

### **Policy**

Aquaculture is recognized as one of the fastest growing industries in the County, and is deemed beneficial to the County. The County supports the continuation and expansion of aquaculture, and will treat aquaculture facilities and land uses as agricultural facilities and land uses.

### **Programs**

- Amend the County Zoning Ordinance as needed to assure that aquaculture enjoys the same land use rights as other agricultural uses.
- Amend the County Zoning Ordinance as needed to permit, with appropriate review for compliance with local and state regulations, labor housing on property utilized for aquacultural purposes.





**APPENDIX A**  
**DEPARTMENT OF CONSERVATION**  
**FARMLAND MAPPING AND MONITORING PROGRAM**

**DEFINITIONS FOR IMPORTANT FARMLAND MAP CATEGORIES<sup>1</sup>**

**Prime Farmland<sup>2</sup>.** *Prime Farmland* is land which has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. *Prime Farmland* must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

**Farmland of Statewide Importance<sup>2</sup>.** *Farmland of Statewide Importance* is land other than *Prime Farmland* which has a good combination of physical and chemical characteristics for the production of crops. It must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

**Unique Farmland.** *Unique Farmland* is land which does not meet the criteria for *Prime Farmland* or *Farmland of Statewide Importance*, that has been used for the production of specific high economic value crops (as listed in California Agriculture produced by the California Department of Food and Agriculture) at some time during the two update cycles prior to the mapping date. It has the special combination of soil quality, location, growing season and moisture supply needed to produce sustained high quality or high yields of a specific crop when treated and managed according to current farming methods. Examples of such crops may include oranges, olives, avocados, rice, grapes, and cut flowers. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

**Farmland of Local Importance.** *Farmland of Local Importance* is either currently producing crops, or has the capability of production. *Farmland of Local Importance* is land other than *Prime Farmland*, *Farmland of Statewide Importance*, or *Unique Farmland*. This land may be important

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<sup>1</sup> These definitions have been excerpted from A Guide to the Farmland Mapping and Monitoring Program, 1992, Department of Conservation, Office of Land Conservation, Publication Number FM-92-01.

<sup>2</sup> Soil types qualifying for these two categories are provided by the U.S. Soil Conservation Service.



to the local economy due to its productivity. It does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

This category varies from county-to-county and is determined by each county's board of supervisors and a local advisory committee.

**Grazing Land.** *Grazing Land* is land on which the existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing of livestock. The minimum mapping unit for *Grazing Land* is 40 acres.

**Urban and Built-up Land.** *Urban and Built-up Land* is used for residential, industrial, commercial, construction, institutional, public administrative purposes, railroad yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures, and other development purposes. Highways, railroads, and other transportation facilities are mapped as a part of *Urban and Built-up Land* if they are a part of the surrounding urban areas.

The minimum mapping unit is ten acres. Units of land smaller than ten acres will be incorporated into the surrounding map classifications. The building density for residential use must be at least one structure per 1.5 acres (or approximately 6 structures per 10 acres). *Urban and Built-up Land* must contain man-made structures or the infrastructure required for development (e.g., paved roads, sewers, water, electricity, or in specific circumstances, drainage or flood control facilities) that are specifically designed to serve that land. Parking lots, storage and distribution facilities, and industrial uses such as large packing operations for agricultural produce will generally be mapped as *Urban and Built-up Land*, even though they are associated with agriculture.

*Urban and Built-up Land* does not include strip mines, borrow pits, gravel pits, farmsteads, ranch headquarters, commercial feedlots, greenhouses, poultry facilities, and road systems for freeway interchanges outside of areas classified as *Urban and Built-up Land* areas.

Within areas classified as *Urban and Built-up Land*, vacant and nonagricultural land which is surrounded on all sides by urban development and is 40 acres or less in size will be mapped as *Urban and Built-up Land*. Vacant and nonagricultural land larger than 40 acres in size will be mapped as *Other Land*.

**Other Land.** *Other Land* is that which is not included in any of the other mapping categories. The following types of land are generally included:

- a. Rural development which has a building density of less than one structure per 1.5 acres, but with at least one structure per ten acres;
- b. Brush, timber and other lands not suitable for livestock grazing;
- c. Government lands not available for agricultural use;





- d. Road systems for freeway interchanges outside of *Urban and Built-up Land* areas;
- e. Vacant and nonagricultural land larger than 40 acres in size and surrounded on all sides by urban development;
- f. Confined livestock facilities of 10 or more acres unless accounted for by the county's definition for *Farmland of Local Importance*;
- g. A variety of other rural land uses;
- h. Strip mines, borrow pits, gravel pits, ranch headquarters larger than 10 acres.

**Land Committed to Nonagricultural Use.** *Land Committed to Nonagricultural Use* is land that is permanently committed by local elected officials to nonagricultural development by virtue of decisions which cannot be reversed simply by a majority vote of a city council or county board of supervisors.

County boards of supervisors and city councils will have the final authority to designated lands in this category pursuant to the requirements of this section. The Department will work with city and county planning staffs to obtain this information.

*Land Committed to Nonagricultural Use* will be shown on an overlay to the Important Farmland Series maps (and Interim Farmland Maps). The current land use will be indicated on the base map, with the overlay indicating the areas that are *Committed to Nonagricultural Use*.

*Land Committed to Nonagricultural Use* must be designated in an adopted, local general plan for future nonagricultural development. The resulting development must meet the requirements of *Urban and Built-up Land* or the rural development density criteria of *Other Land*.

*Land Committed to Nonagricultural Use* must also meet the requirements of either (a) or (b) below:

- a. It must have received on the following final discretionary approvals:
  - 1. Tentative subdivision map (approved per the Subdivision Map Act);
  - 2. Tentative or final parcel map (approved per the Subdivision Map Act);
  - 3. Recorded development agreement (per Section 65864 of the Government Code);
  - 4. Other decisions by a local government which are analogous to items #1-3 above and which exhibit the element of permanence discussed in *Land Committed to Nonagricultural Use*. Zoning by itself does not qualify as a permanent commitment.

OR





- b. It must be the subject of one of the final fiscal commitments to finance the capital improvements specifically required for future development of the land in question as shown below:
1. Recorded Resolution of Intent to form a district and levy an assessment;
  2. Payment of assessment;
  3. Sale of bonds;
  4. Binding contract, secured by bonds, guaranteeing installation of infrastructure;
  5. Other fiscal commitments which are analogous to items #1-4 above and exhibit the element of permanence discussed for *Land Committed to Nonagricultural Use*.

*Land Committed to Nonagricultural Use* will be mapped when the respective local government notifies the Department that the land meets qualifying criteria and submits maps at a scale of 1:24,000 identifying the area and showing its boundaries. The notification referred to will be subject to verification by the Department. In the case of land identified per Sections (a)4 and (b)5, the local government must also provide the Department with documentation of the permanent commitment.



**APPENDIX B**  
**RIGHT TO FARM ORDINANCE**

(From Division 2, Title 6 of the Codified Ordinances of the County of Imperial)

Section 62950.	Findings and Policy
Section 62951.	Definitions
Section 62952.	Nuisance
Section 62953.	Disclosure
Section 62954.	Resolution of Disputes
Section 62955.	Severability

§62950. Findings and Policy.

(a) It is the declared policy of this County to enhance and encourage agricultural operations within the County. It is the further intent of this County to provide to residents of this County proper notification of the County's recognition and support through this ordinance of those persons' and/or entities' right to farm.

(b) Where non-agricultural land uses extend into agricultural areas or exist side by side, agricultural operations frequently become the subjects of nuisance complaints due to lack of information about such operations. As a result, agricultural operators are forced to cease or curtail their operations. Such actions discourage investments in farm improvements to the detriment of adjacent agricultural uses and the economic viability of the County's agricultural industry as a whole. It is the purpose and intent of this ordinance to reduce the loss to the County of its agricultural resources by clarifying the circumstances under which agricultural operations may be considered a nuisance. This ordinance is not to be construed as in any way modifying or abridging State law as set out in the California Civil Code, Health and Safety Code, Fish and Game Code, Food and Agricultural Code, Division 7 of the Water Code, or any other applicable provision of State law relative to nuisances; rather it is only to be utilized in the interpretation and enforcement of the provisions of this ordinance and County regulations.

(c) An additional purpose of this ordinance is to promote a good neighbor policy by advising purchasers and users of property adjacent to or near agricultural operations of the inherent potential problems associated with agricultural operations. Such concerns may include, but are not limited to, noises, odors, light, fumes, insects, dust, chemicals, smoke, the operation of machinery of any kind during any 24 hour period (including aircraft), the storage and disposal of manure, and the application of chemical fertilizers, soil amendments, and pesticides. It is intended that, through mandatory disclosures, purchasers and users will better understand the impact of living near agricultural operations and be prepared to accept attendant conditions as the natural result of living in or near rural areas.





§ 62951. Definitions.

As used in this Chapter No. 1.

(a) "Agricultural Land" shall mean all that real property within the boundaries of Imperial County currently used for agricultural operations or upon which agricultural operations may in the future be established.

(b) "Agricultural Operation" shall mean and include, but not be limited to, the cultivation and tillage of the soil; dairying; the production, irrigation, application of agricultural chemicals, frost protection, cultivation, growing, harvesting, packing and processing of any agricultural commodity, including production of vegetables, fruits, forage, grain seeds, fiber and all other plants; viticulture, horticulture, apiculture, aquaculture; the raising of livestock, fur bearing animals, game birds and all other kinds of animal husbandry; the culture or breeding of livestock, poultry, fish, marine life, and all other types of animal or plant life; and commercial practices performed as incident to or in conjunction with such agricultural operations, inclusive of the operation of equipment (including agricultural aircraft, and machinery); selling, processing, packing, preparation for market, delivery to storage or market or to carriers for transportation to market. Agricultural operations shall also include innovative and experimental methods of accomplishing agricultural operations when such methods are found and determined to be a reasonable alternative, or improvement, to currently accepted methods of operation.

§ 62952. Nuisance.

No present or future lawful agricultural activity, operation, or facility or appurtenances thereof, conducted or maintained for commercial purposes, and in a manner consistent with proper and accepted customs and standards, as established and followed by similar agricultural operations in Imperial County, shall be or become a nuisance, public or private, if it was not a nuisance when it began. Provisions of this ordinance shall not apply whenever a nuisance results from the negligent, unlawful or improper operation of any such agricultural operation or if the agricultural operation obstructs the free passage or use, in the customary manner, of any navigable lake, river, stream, canal, basin; any public park, square street or highway.

§ 62953. Disclosure.

(a) The disclosure statement required by this ordinance shall be used under the following circumstances and in the following manners:

(1) The County of Imperial Tax Collector shall mail a copy of the disclosure set forth in subpart (b) to all owners of real property in Imperial County with the annual 1990-1991 tax bill.

(2) The County of Imperial Recorder shall mail a copy of the disclosure set forth in subpart (b) with all real property conveyances returned by mail.



(3) The Planning Director/Building Official shall cause the notice described in subsection (b) to be included and/or attached to all building permits issued in Imperial County for projects on land that lies partly or wholly within, or within 1/4 of a mile of agricultural land.

(b) The disclosure required by subsection (a) shall be the following:

"The County of Imperial permits operation of properly conducted agricultural operations within the County. If the property you are purchasing or own is located near agricultural lands or operations or included within an area zoned for agricultural purposes, you may be subject to inconveniences or discomfort arising from such operations. Such discomfort or inconveniences may include, but are not limited to: noises, odors, light, fumes, dust, smoke, insects, chemicals, operation of machinery (including aircraft) during any 24 hour period, storage and disposal of manure, and the application by spraying or otherwise of chemical fertilizers, soil amendments, herbicides and pesticides. One or more of the inconveniences described may occur as a result of any agricultural operation which is in conformance with existing laws and regulations and accepted customs and standards. If you live near an agricultural area, you should be prepared to accept such inconveniences or discomfort as a normal and necessary aspect of living in a county with a strong rural character and an active agricultural sector. Imperial County has established a grievance committee to assist in the resolution of any disputes which might arise between residents of this County regarding agricultural operations. If you have any questions concerning this policy or the grievance committee, please contact the Agricultural Commissioner's Office at 339-4314."

§ 62954. Resolution of Disputes.

(a) Should any controversy arise regarding any inconveniences or discomfort occasioned by agricultural operations, including, but not limited to, noises, odors, fumes, light, dust, the operation of machinery of any kind during any 24 hour period (including aircraft), the storage and disposal of manure, and the application by spraying or otherwise of chemical fertilizers, soil amendments, herbicides and pesticides, the parties may submit the controversy to a grievance committee ("County Agricultural Grievance Committee") as set forth below in an attempt to resolve the matter prior to the filing of any court action.

(b) Any controversy between the parties may be submitted in writing to the Imperial County Agricultural Commissioner within 15 calendar days of the occurrence of the particular activity giving rise to the dispute. The Agricultural Commissioner, within 15 calendar days, will review the written complaint and attempt to mediate the dispute. If mediation is not achieved, the Agricultural Commissioner shall notify the County Agricultural Grievance Committee within 15 days, of his determination. The County Agricultural Grievance Committee, whose decision shall be advisory only, shall meet within thirty (30) days of the date the Committee receives the notice of determination by the Agricultural Commissioner.



(c) The County Agricultural Grievance Committee shall be composed of three (3) members selected from the community by the Imperial County Board of Supervisors, and may include representatives from the County Agricultural Commissioner's Office, a local real estate association, local pest control operators association and/or representatives of other county offices.

(d) The effectiveness of the County Agricultural Grievance Committee as a forum for resolution of disputes is dependent upon a full discussion and complete presentation of all pertinent facts concerning the dispute in order to eliminate any misunderstandings. The parties are encouraged to cooperate in the exchange of pertinent information concerning the controversy.

(e) The controversy shall be presented to the Committee by written requests of one of the parties or the County Agricultural Commissioner within the time limits specified. Thereafter the Committee may investigate the facts of the controversy, but must, within thirty (30) days, from receipt of the request, hold a meeting to consider the merits of the matter. At the time of the meeting both parties shall have an opportunity to present what each considers to be pertinent facts. Within twenty (20) days of the meeting, the Committee shall render a written decision to the parties.

(f) Any costs of the grievance, including the investigative costs, shall be borne by the losing party or in such proportion as the County Agricultural Grievance Committee shall decide.

§ 62955. Severability.

If any section, subsection, sentence, clause or phrase of this ordinance is for any reason held to be invalid or unconstitutional by the decision of a court of competent jurisdiction, it shall not affect the remaining portions of the ordinance.

Adopted by the County Board of Supervisors on August 7, 1990, as Ordinance 1031.







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conservation and open space element

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## **IMPERIAL COUNTY GENERAL PLAN CONSERVATION AND OPEN SPACE ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

The County of Imperial is rich in natural and cultural resources. The landscape is dominated by native desert habitat and stark topographic features. Prime soils, Colorado River water, and year-round sunlight facilitate productive agricultural operations. Natural mineral resources are extracted for commercial purposes. The wide expanses of open space are useful for military maneuvers and recreational activities.

Population growth and subsequent development have intensified the rate of resource use and regional environmental degradation. Urban expansion is decreasing the amount of land available for agriculture and mineral extraction. The pollution of air and water has diminished regional aesthetics, limited recreational opportunities, and threatened public health. Native desert biological communities are being impacted by accelerated human activity in Imperial Valley.

Two mandatory elements of the County's General Plan are addressed in the Conservation and Open Space Element and it fulfills the requirements of pertinent State legislation (Conservation Element--Government Code Sections 65302(d), and Public Resources Code Sections 2762 and 2763; Open Space Element--Government Code Sections 65302(e) and 65560, et seq. and Public Resources Code Section 5076). The Conservation and Open Space Element is the official conservation guide for all decision makers including the County Board of Supervisors, Planning Commission, Airport Land Use Commission, and various Departments in addition to other federal, state, or local governmental decision-making bodies. It shall also serve as a guide to the private sector, business community, investors, and developers in the County.

This Conservation and Open Space Element is concerned with the following environmental resources:

- Biological Resources
- Cultural Resources
- Soils
- Minerals
- Energy
- Regional Aesthetics
- Air Quality
- Open Space

Separate elements have been prepared for the conservation of water, agricultural, and geothermal resources. These three types of resources are critical to the long-term economic stability of Imperial County. In addition, the issues surrounding these resources are particularly complex. The Water Element, Agricultural Element, and Geothermal and Transmission Element contain focused goals and objectives, and an implementation program specific to each resource.



The implementation of this Element does not negate the environmental review process required by the California Environmental Quality Act (CEQA) and the National Environmental Protection Act (NEPA). While a proposed project may conform to the Conservation and Open Space Element, it is still subject to impact assessment pursuant to CEQA and NEPA. This Element supports environmental review for proposed projects in addition to determining the extent that proposed projects promote the Element goals and objectives.

## **B. Purpose of the Element**

The County is charged with the responsibility of conserving environmental resources while encouraging economic development and growth. The Conservation and Open Space Element identifies goals and policies to insure the managed use of environmental resources. The goals and policies are also designed to prevent limiting the range of resources available to future generations.

The purpose of the Conservation and Open Space Element is to:

- Promote the protection, maintenance, and use the County's natural resources with particular emphasis on scarce resources and resources that require special control and management.
- Prevent the wasteful exploitation, destruction, and neglect of the State's natural resources.
- Recognize that natural resources must be maintained for their ecological value as well as for the direct benefit to the public.
- Protect open space for the preservation of natural resources, the managed production of resources, outdoor recreation, and public health and safety.

## **C. Applicability**

The Conservation and Open Space Element applies to all unincorporated land within the County of Imperial. Each incorporated City must adopt its own general plan and subsequent conservation and open space elements. It is the intent of the County to be consistent and supportive of complementary plans of incorporated areas. Since natural resources characteristically cross political boundaries, planning for the use and conservation of resources requires cooperation between various governmental divisions and departments. When an area falls under more than one jurisdiction, each should consider the Conservation and Open Space Element goals and programs of the other jurisdiction when making decisions. All public and private projects are subject to this Element.

It is not the intent of this Element to impose any restriction on the use of any private land which would constitute a taking or a damaging of property for public use. This type of action might require payment or just compensation for damages. In the event that the County Board of Supervisors, Planning Commission, or an official of the County determines that the application of any provision of this Element to any private property constitutes such a taking, the restrictions should be modified or waived to the extent necessary to avoid the taking or damaging. It is specifically not the intent of this Element to preclude the placement, construction, or the use of one single-family residence on any parcel that existed as a legal parcel of record at the time of the adoption of the





Element, and no individual or public safety hazard or danger would result from such placement or construction. Furthermore, the inventory of conservation issues and subsequent policy discussed in this Element are not intended to be all inclusive and may be amended when additional information or studies become available or are required.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

This report focuses on specific environmental resources in Imperial County, including biological and cultural resources, soils, minerals, energy, regional aesthetics, air quality, and open space. Additional information on mineral and soil resources is located in Appendix A.

### **B. Biological Resources**

#### **1. Plants and Vegetative Habitats**

Figure 1 shows the distribution of major vegetation types throughout the County. A broad range of biotic communities have been identified in Imperial County, ranging from those dependent upon the river ecology of the Colorado to the saltbush-alkali scrub habitats. The predominant plant community in the County is cultivated/ruderal, and is associated with agricultural and other human activities. This plant community, which consists of cropland, pasture land and orchards, is most widespread in the Imperial Valley. The Valley floor historically consisted of a creosote scrub plant community, but was replaced by agricultural activity after 1900. The dominant crops now being cultivated in the Valley include cotton, chard, lettuce, and alfalfa.

Agricultural activities have encouraged the spread of opportunistic plant species including weedy varieties and larger plants, such as salt cedar, most of which are not native to the area. The Valley floor consists largely of non-native and introduced plants, including date palms, a variety of grasses, and ornamental specimen trees and shrubs.

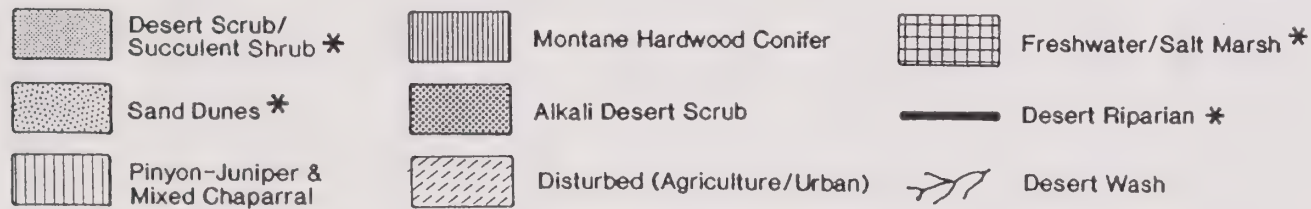
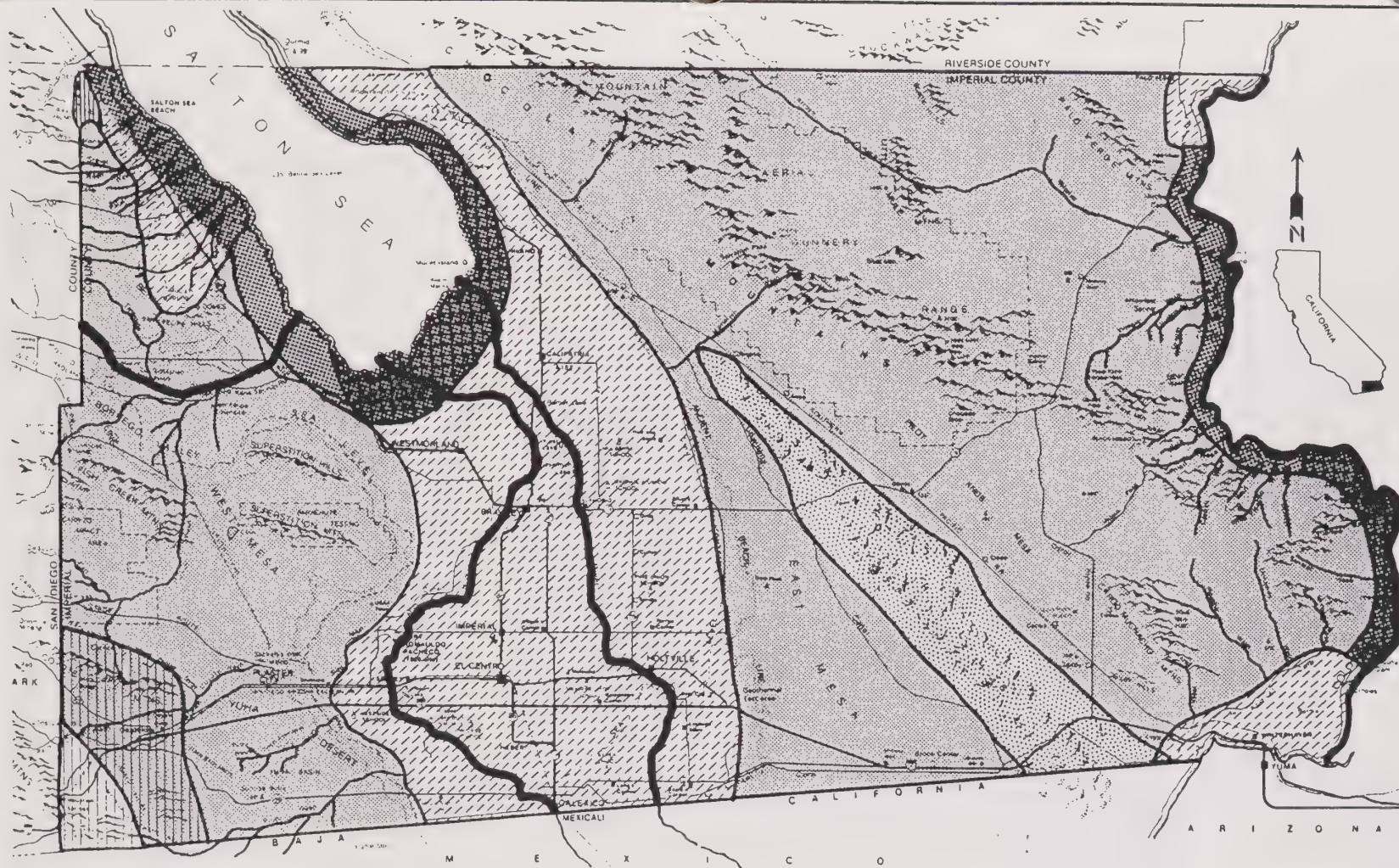
The term "ruderal" refers to the type of vegetation which grows in response to human disturbance: along roadsides, at the borders of cultivated fields, and in canal riparian/levee areas. This generally weedy vegetation can intrude rapidly into moist and periodically disturbed areas, and includes such plants as cheeseweed, shepherds purse, white horse-nettle, saltbush, saltcedar, Russian thistle, Bermuda grass and other opportunistic plants.

The undeveloped portions of the County support limited and much more specialized native plant communities. Where naturally occurring sources of water are available, special and often unique communities thrive. Eleven indigenous plant communities are identified within the County: desert riparian (cottonwood-willow), fresh emergent wetlands (freshwater marsh), alluvial washes, palm oases, desert scrub (creosotebush), desert succulent shrub, alkali desert scrub (saltbush), sand dune, mixed chaparral, pinyon-juniper, and montane hardwood-conifer.

The waterways of the Colorado River, the All-American Canal, the Alamo River and the New River support riparian and freshwater marsh habitats. Characteristic wetland plant species associated with these habitats include willows, western cottonwood, mesquite, velvet ash, tamarisk, big-leaf sedge, cattails, baltic rush, and bulrushes in the overstory; quailbush, Mojave seabligh, desert lavender, seep willow, red-root nutgrass, saltgrass, and arrowweed in the understory; as well as a variety of weedy species such as ripgutgrass, dallisgrass, mustard, telegraphweed, curly dock, spiny clothur, western ragweed, white sweetclover, wild lettuce, and doveweed.







\* SENSITIVE  
HABITATS

0 6 12 miles



Imperial County  
General Plan

Imperial County Habitat Map

Conservation and Open Space Element

Figure  
1





Desert wash habitats are characterized by the presence of arborescent, often spiny, shrubs generally associated with intermittent streams (washes) or alluvial deposits adjacent to washes. This habitat occurs throughout the drier portions of the County, outside of the Imperial Valley. Canopy species typically found in washes include palo verde, desert ironwood, smoketree, cat-claw acacia, mesquite, and tamarisk. Plants of the subcanopy include desert broom, desert willow, crucillo, Anderson's wolfberry, and arrowweed. Groundcover species include white brittlebush, desert goldenbush, saltbush, barrel cactus, white bursage, desert lavender, snakeweed, as well as a variety of forbs and grasses.

All natural or naturalized plant assemblages that include California fan palms are recognized as palm oasis habitats. This habitat exists at localized sites around the Salton Sea basin where the following soil and water requirements are met: moist alkaline soils near seeps, springs and permanent streams. Coyote willow, western cottonwood, California sycamore, velvet ash, mesquite and tamarisk are other tree species associated with fan palms. Understory species include alkali goldenbush, squaw waterweed and arrowweed. Forbs and grasses include alkali sacaton and wiregrass.

Desert scrub is the most widespread habitat in the California deserts. They are well-developed on valley floors and alluvial deposits adjacent to washes. Creosotebush is generally the dominant plant species in this habitat. Other species include saltbush, indigo bush, desert goldenbush, white brittlebush, burrobrush, white bursage, cat-claw acacia, bladderpod, desert agave, barrel and hedgehog cactus, branched pencil and teddybear cholla, Palmer's coldenia, Wiggin's croton, desert globemallow, jojoba, little-leaf krameria, ocotillo, beavertail, prickly-pear, Douglas and rubber rabbitbrush, desert sand verbena, desert senna, squaw waterweed, Anderson's wolfberry, and Mojave yucca. Forbs and grasses include triangle evening primrose, big galletagrass and Spanish-needles.

Desert succulent shrub habitats are generally found on southfacing slopes, with rocky soils that are well-drained. These succulent-dominated stands are usually denser than creosotebush, and constituent plants are more evenly spaced. Shrub dominants include ocotillo, Mojave yucca, desert agave, buckthorn cholla, branched pencil and teddybear cholla, grizzlybear and beavertail pricklypear, barrel and hedgehog cactus, and saguaro. Nonsucculent subshrubs typically comprise the understory.

Alkali scrub habitats can generally be found surrounding the receding shores of large prehistoric lakes or alkali playas that mark the locations of dry lake beds. It also occurs along the Colorado River, particularly in areas of old river bed meanders. This habitat is subdivided into a xerophytic phase, which generally consists of species with low salt tolerance, and a holophytic phase, or more salt-tolerant species which exhibit varying degrees of succulence. The diversity of cacti and other succulents is relatively low.

The dunes of the Sand Hills Ecological Area in south-central Imperial County contain many important plant species that have adapted to the extreme arid conditions. Some examples of rare and/or endangered plant species in this area are the Peirson's milk-vetch, Wiggins' croton and Algodones Dunes sunflower. Other sand dune species include yellow spiderwort, desert dicoria, dune primrose, and plicate coldenia.

The mixed chaparral and pinyon-juniper habitats are restricted to a small, overlapping area in the extreme southwestern corner of Imperial County, in the Jacumba Mountains adjacent to the San



Diego County line. Generally found on north-facing slopes in southern California, mixed chaparral supports approximately 240 species of woody plants. Characteristic species found on transmontane slopes include shrub live oak, desert ceanothus, desert bitterbrush, bigberry manzanita, chamise, birch-leaf mountain mahogany, California fremontia, and wild lilac. Natural California fan palms are also found in the Jacumba Mountains.

The pinyon-juniper habitat is generally found on east-facing slopes and at higher elevations than mixed chaparral. Characteristic canopy species include single-leaf and Parry's pinyon, western and California juniper, oaks, and Mojave yucca. Subcanopy plants include big sagebrush, blackbrush, narrow-leaf goldenbush, Parry's nolina, curly-leaf mountain mahogany, antelope bitterbrush, Parry's rabbitbrush, chamise, and snakeweed. Grasses and forbs associated with this habitat include western wheatgrass, blue grama and Indian ricegrass.

As with the mixed chaparral and pinyon-juniper habitats discussed above, the montane hardwood-conifer forest is restricted to a small area in the extreme northwestern corner of Imperial County, in the Santa Rosa Mountains adjacent to the Riverside County line. Common plant associations for this habitat type found in the Transverse Mountain Range of southern California include Pacific madrone, oaks, ponderosa and sugar pine, and incense-cedar.

## **2. Wildlife**

The conditions created by the arid desert climate and continued expansion of agriculture have resulted in an abundance and diversity of wildlife habitats that vary substantially across Imperial County. Many species occurring in the County are highly localized and are dependent upon the type of vegetative communities available. For example, the Imperial Valley provides a dramatic mix of arid desert and water-oriented habitat areas which support a broad range of native and introduced year-round and migrant animal species. The sizable areas in active cultivation also provide important foraging habitat for numerous birds and small mammals.

### **Fish**

The Salton Sea is home to at least twelve species of fish which have been introduced either directly by the California Department of Fish and Game (CDFG) and federal Bureau of Land Management (BLM) biologists or indirectly through migration from local irrigation canals. Very few fish can tolerate the high salinity of the Salton Sea. The introduction of several species of marine fish into the Salton Sea in 1950 resulted in the largest inland fishery in California. Some of these introduced saltwater species include orangemouth corvina, sargo, gulf croaker, sailfin molly, longjaw mudsucker, and tilapia. The endangered desert pupfish is a native fish found around the fringes of the Salton Sea; within the San Felipe and Whitewater Creeks which feed into it.

Freshwater fish are found in rivers, canals and some marsh areas. Some of the introduced species include threadfin shad, mosquitofish, red shiner, California killifish, largemouth bass, white and channel catfish. Tilapia is found in both fresh and saltwater. Native freshwater fish species include the endangered Colorado squawfish, bonytail chub and humpback sucker.





## **Amphibians and Reptiles**

Some of the amphibian species found in or near freshwater habitats of Imperial County include the Colorado river toad, red-spotted toad, California red-legged frog, leopard frog, bullfrog, and spiny softshell turtle.

Desert scrub and rocky outcrops throughout the County provide excellent burrowing, foraging, and boulder habitat for a variety of reptiles. Typical reptile species include the chuckwalla, banded and magic geckos, western iguana, desert horned lizard, flat-tailed horned lizard, zebra-tailed lizard, long-tailed brush lizard, long-nosed leopard lizard, Colorado fringe-toed lizard, collared lizard, side-blotched lizard, desert spiny lizard, western whiptail lizard, western rattlesnake, sidewinder, red racer, common kingsnake, gopher snake, checkered garter snake, western blind snake, western patch-nosed snake, western ground snake, desert glossy snake, and desert tortoise.

## **Birds**

Imperial County is located on one of the most important flyway corridors in the western hemisphere for migrant waterfowl, shorebirds and songbirds. Generally, the greatest numbers and diversity of birds are found during the spring and fall months. The variety and diversity of bird species is greater than for most animals, undoubtedly due to their high degree of mobility and broad foraging habits. Approximately 378 species of birds have been identified in Imperial County, as compared to only 41 species of mammals and 31 species of reptiles and amphibians. The food potential of cultivated areas is the main contributor to the broad range of bird species frequenting the County. Some of the species associated with these agricultural areas include waterfowl, gulls, herons, egrets, doves, Gambel's quail, sparrows, finches, and juncos. Raptors include the marsh hawk, red-tailed hawk and burrowing owl. Flocks of ring-billed gulls, red-winged black birds, and cattle egrets will frequent area agricultural fields after recent harvests or plowing.

The presence of the Salton Sea, rivers, canals, drainage ditches and fish farms offer attractive food sources, nesting and resting sites for many bird species. The importance of the relatively rare desert riparian systems, freshwater marshes, palm oases, and alluvial washes in supporting wildlife populations cannot be overstated. These habitats support more bird species at greater densities than other desert habitats.

The diversity of bird species is relatively low in desert scrub habitats. The restricted areas of mixed chaparral, pinyon-juniper and montane hardwood-conifer habitats found along the western San Diego/Imperial County boundary offer valuable food sources, cover, nesting, roosting and foraging opportunities for many bird species.

## **Mammals**

Most indigenous medium and large-sized mammals, such as foxes, coyotes and badgers, have disappeared from the Valley floor, but can still be found in relatively undisturbed areas near sources of water. Coyotes are often found around orchards, where they feed on fruit and small mammals. Smaller mammals have adapted better to the intense human activity in the Valley, especially small rodent species capable of exploiting marginal habitats along canals, agricultural drains, roadsides, and around buildings. Some of these rodents include the western harvest mouse, Norway and black



rat, valley pocket gopher, and muskrat. The striped and spotted skunk is also common in the Imperial Valley. Raccoons are strongly associated with water, and may also be attracted to the Valley floor due to the presence of agricultural canals. Brush rabbit is likely to feed on various non-native grasses and small plants within the Valley. Finally, many species of bats, some residents to the area and others migrants, are found in the Valley due to the presence of fruit, fruit flies and agricultural canals, which provide excellent foraging areas for insects as well as functioning as reliable water sources.

Characteristic mammalian species found in native desert scrub habitats surrounding the Imperial Valley and Salton Sea include cactus and deer mouse, desert and spiny pocket mouse, little and long-tailed pocket mouse, desert and Merriam kangaroo rat, desert and whitethroated woodrat, Arizona and hispid cottonrat, white-tailed antelope and roundtail ground squirrel, desert and blacktail jackrabbit, desert cottontail, desert shrew, desert kit and gray fox, bobcat, wild burro, mule deer, and peninsular and Nelson's bighorn sheep.

### **3. Sensitive Species and Habitats**

Figures 2a, 2b, and 2c show general locations where sensitive plant and animal species have been identified, and the extent of sensitive habitats within Imperial County. Figure 3 shows "Resource Areas" which have been identified by state and federal agencies.

#### **Plants**

Sensitive plant species are determined by their rarity, endangerment and limited distribution. There are three listing authorities for sensitive plants in California: the California Native Plant Society (CNPS), a private organization; the CDFG; and the U.S. Fish and Wildlife Service (USFWS). Of the 28 sensitive plant species in Imperial County, the following three are officially listed as "Rare", "Threatened", or "Endangered" by either the USFWS and CDFG: Pierson's milk-vetch, Wiggins' croton and Algodones Dunes sunflower.

Twenty-five plants are considered "Rare, Threatened, or Endangered" by the CNPS, or are placed on a "Watch List" by the USFWS and/or CNPS. These include sand-food, California ayenia, elephant tree, Dunn's mariposa, two species of lip fern, Las Animas colubrina, foxtail cactus, Gander's cryptantha, Parish's larkspur, California ditaxis, desert tea, wild buckwheat, San Diego coyote thistle, flat-seeded spurge, Tecate tarplant, crucifixion thorns, Mountain Springs bush lupine, Mason Valley cholla, Munz's cholla, Wiggins' cholla, giant Spanish-needle, Thurber's sandpaper-plant, Orocopia sage, and Orcutt's woody aster.

#### **Fish**

All four native fish species occurring within Imperial County are listed as "Endangered" by the CDFG. The bonytail chub, desert pupfish and Colorado squawfish are also listed as "Endangered" by the USFWS. The humpback (or razorback) sucker is a Category 1 candidate for the federal "Endangered" species list. As mentioned, the desert pupfish occurs within the San Felipe and Whitewater Creeks which feed into the Salton Sea, and the other freshwater fish are found in rivers, canals and marsh areas.





Figure 2a

Sensitive Plants

	Pierson's Milk-Vetch
	Munz's Cactus
	Sand Food
	Orcutt's Aster
	Orocopia Sage
①	Algodones Dunes Sunflower
②	Wiggins' Croton
③	Wiggins' Cholla
④	Mountain Springs Bush Lupine

Figure 2b

Sensitive Wildlife Areas

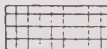


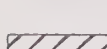








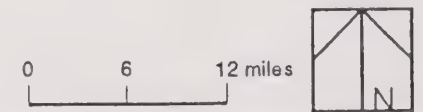
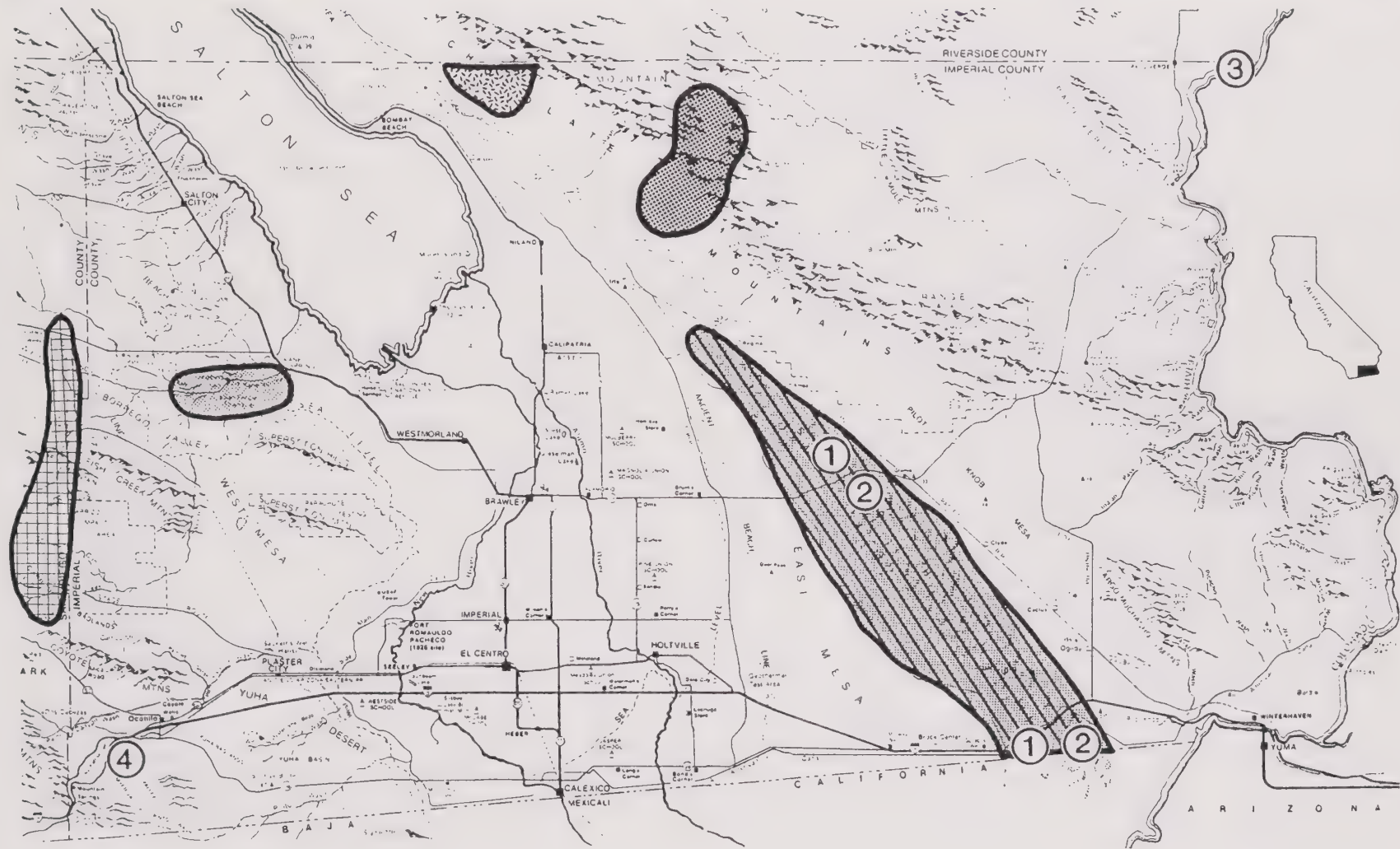
	Desert Bighorn Sheep
	Golden Eagle
	Potential Desert Tortoise Habitat
	Large Areas of Sensitive Animal Species
Ⓐ	Andrew's Dune Scarab Beetle
Ⓒ	California Black Rail
Ⓜ	Barefoot Banded Gecko
Ⓨ	Yuma Clapper Rail
Ⓟ	Desert Pupfish
Ⓑ	Brown Pelican, Aleutain Canada Goose, Bald Eagle, Osprey, Peregrine Falcon
Ⓢ	Sandhill Crane
←--→	Probable Wildlife Corridors
↔	Known Wildlife Corridors
	Flat-tailed Horned Lizard (See Figure 13 for Current Range)

Figure 2c

Unusual Plant Assemblages

	Mountain Springs Grade Blackbrush
	Smugglers Cave Chaparral
	Chocolate Mountains Munz Cholla
	Yuha Desert Crucifixion Thorn
	Mesquite Hummocks*
	Davies Valley Succulent Scrub
	Imperial Sand Dunes
	Picacho Peak/Chocolate Mountains All-Thorn
	* (any Mesquite Hummock in the County is considered a UPA)





Imperial County  
General Plan

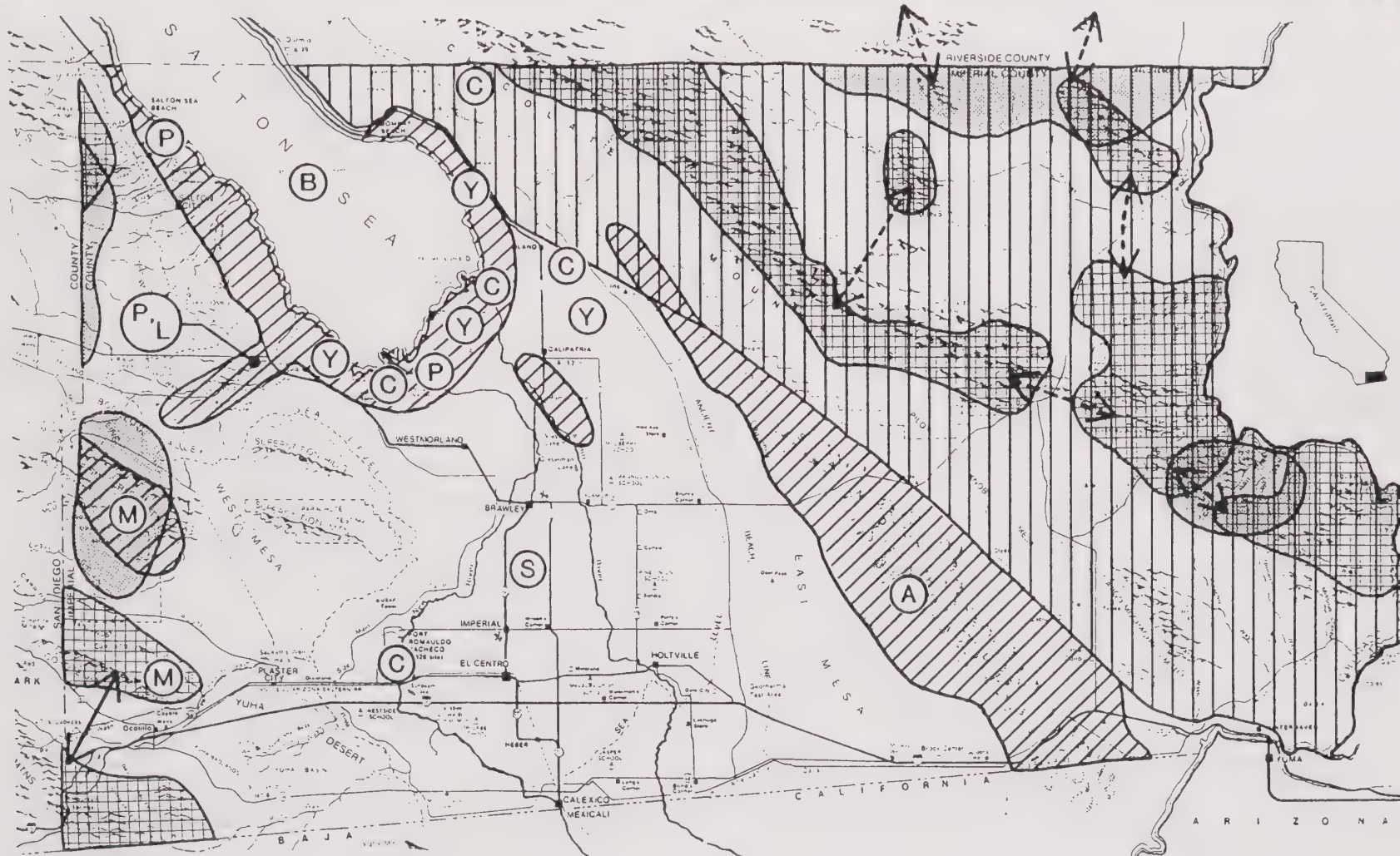
Sensitive Plants

Conservation and Open Space Element

Figure  
2a







0 6 12 miles



Imperial County  
General Plan

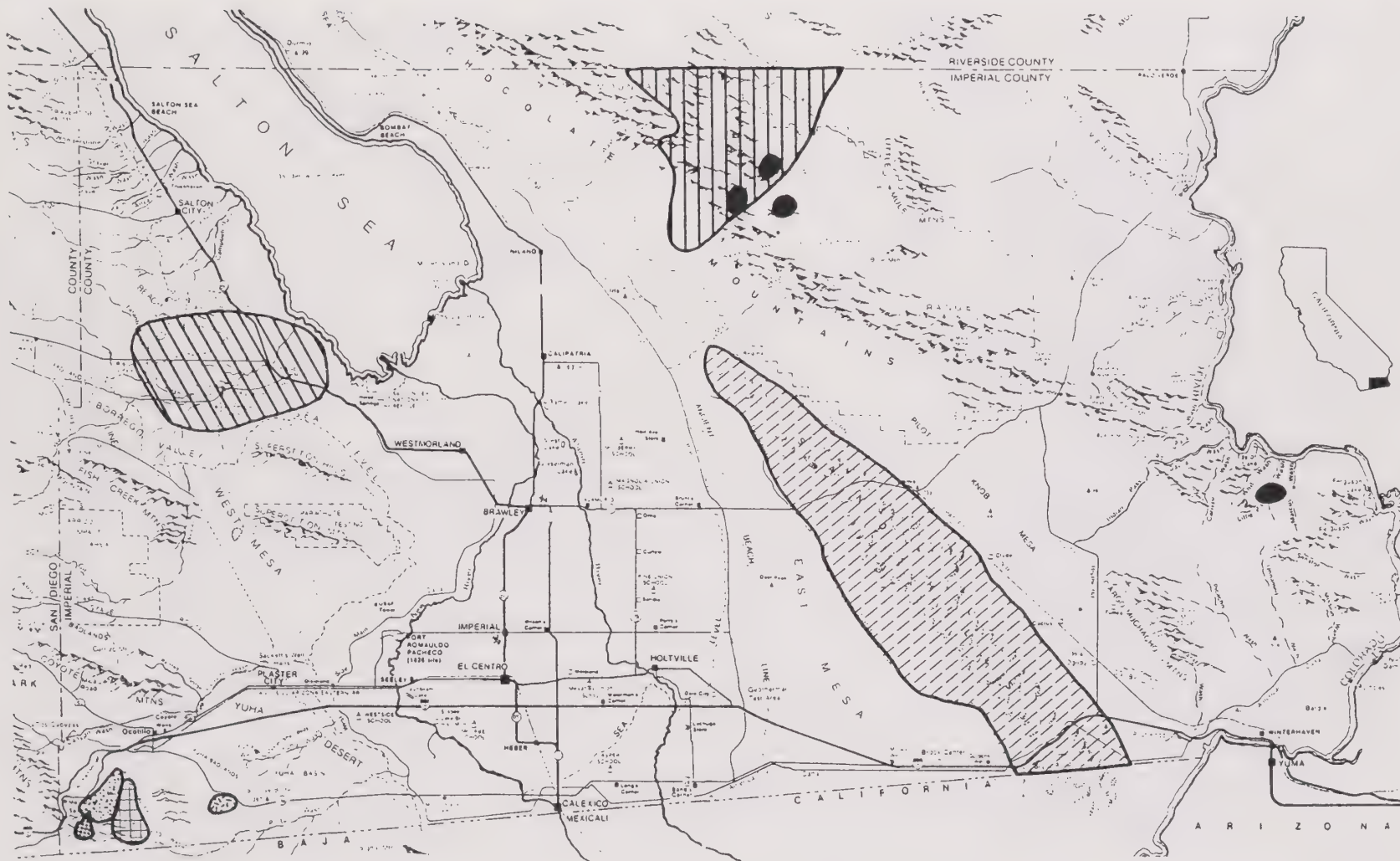
Sensitive Wildlife Areas

Figure  
2b

Conservation and Open Space Element







Imperial County  
General Plan

Unusual Plant Assemblages

Conservation and Open Space Element

Figure  
2c





Areas of Critical Environmental Concern (ACEC)  
and Wildlife Habitat Areas (WHA)

- ① Chuckwalla Bench (Desert Tortoise) ACEC
- ② San Sebastian Marsh/San Felipe Creek (Desert Pupfish) ACEC
- ③ Yuha Basin ACEC
- ④ East Mesa (Flat-Tailed Horned Lizard) ACEC
- ⑤ Milpitas Wash WHA
- ⑥ Indian Wash WHA
- ⑦ Algodones Dunes WHA
- ⑧ Pinto Wash WHA
- ⑨ Coyote Mountains/Davies Valley (Barefoot Banded Gecko) WHA
- ⑩ Smuggler's Cave (Southern Mixed Chaparral) WHA
- ⑪ Picacho Special Attention Area

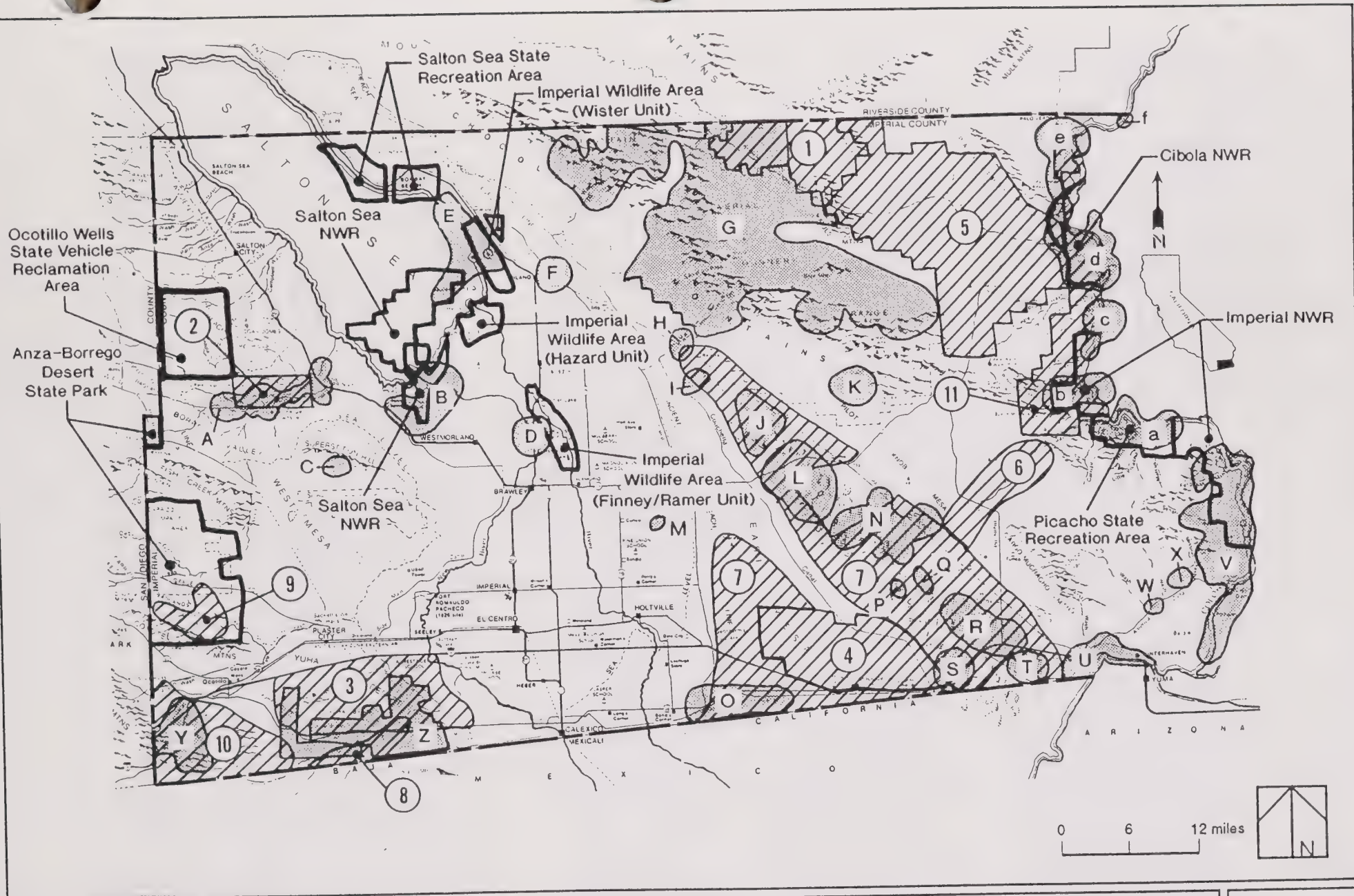


Significant Natural Areas (SNA)

- A San Sebastian Marsh SNA
- B New River SNA
- C Superstition Hills SNA
- D Ramer and Finney Lakes SNA
- E Mullet Island SNA
- F Camp Dunlop SNA
- G Chocolate Mountains SNA
- H Tortuga Sand Hills SNA
- I Amos Sand Hills SNA
- J Acolita Sand Hills SNA
- K Glamis Buttes SNA
- L East Mesa Imperial Sand Dunes SNA
- M Holtville Drain SNA
- N Central Imperial Sand Dunes SNA
- O All American Canal SNA
- P Cactus Southwest Dunes SNA
- Q Pilot Knob Mesa West SNA
- R Ogilby Dunes SNA
- S Plank Road SNA
- T Southern Edge Pilot Knob Mesa SNA
- U Yuma Riverbend SNA
- V Ferguson Lake/Imperial Dam SNA
- W Ross Corner SNA
- X Bard Riverbend SNA
- Y In-Ko-Pah Gorge/Pinto Drainage SNA
- Z Crucifixion Thorn SNA
- a Picacho/Taylor and Adobe Lakes SNA
- b Julian/Carrizo Washes SNA
- c Draper SNA
- d Cibola/Gilmore's Landing SNA
- e Palo Verde Valley SNA
- f 38th Street Park SNA







Imperial County  
General Plan

Resource Areas

Conservation and Open Space Element

Figure  
3



## Amphibians and Reptiles

Two amphibian species occurring within or near permanent water sources in Imperial County are listed as "Species of Special Concern" by the CDFG; Colorado river toad and California red-legged frog. The California red-legged frog is also a Category 2 candidate for the federal "Endangered" species list. Four reptilian species within the Imperial Valley are considered sensitive. The desert tortoise is listed as "Threatened" by both the USFWS and CDFG. The barefoot banded gecko is also a State-listed "Threatened" species, but it is on the federal "Endangered" (Category 2) candidate list. The flat-tailed horned lizard is listed as "Threatened" by CDFG, and is also a Category 1 candidate for the federal "Endangered" species list. The Colorado Desert fringe-toed lizard is listed as "Species of Special Concern" by CDFG, and is a Category 2 candidate for the federal "Endangered" species list.

The status of the flat-tailed horned lizard was recently reviewed by both the USFWS and CDFG. In 1990, the federal status of this species was elevated from Category 2 to Category 1 after extensive monitoring by BLM between 1984-86 indicated severe population declines in three out of four special habitat management areas, or Areas of Critical Environmental Concern (ACEC), in the California Desert Conservation Area. These continuing declines are primarily due to significant habitat modification and destruction from recreational and other urban developments, such as off-highway vehicle activity, geothermal, oil and gas development, gold mining, construction of roads and power transmission lines, sand and gravel extraction, pesticide spraying, and habitat fragmentation.

In 1989, the State status of the flat-tailed horned lizard was elevated from "Species of Special Concern" to "Threatened" following a 1988 petition from Dr. Wilbur Mayhew and Ms. Barbara Carlson of the University of California at Riverside to the California Fish and Game Commission. The Petition requested State listing of this sensitive reptile as an endangered species. In response to this petition, *The Status of the Flat-Tailed Horned Lizard (Phrynosoma mcallii) in California* (CDFG, 1989) presents findings in support of the revised listing based on life history parameters and factors responsible for the declining status of this species.

## Birds

Ten bird species occurring or utilizing habitats within Imperial County are listed as "Rare" and/or "Endangered" by the USFWS or CDFG. The southern bald eagle is listed as "Endangered" by the USFWS and CDFG; the American peregrin falcon is listed as "Endangered" by the USFWS and CDFG; the elf owl is listed as "Endangered" by the CDFG; the California brown pelican is listed as "Endangered" by the USFWS and CDFG; the Aleutian Canada goose is listed as "Endangered" by the USFWS; the Yuma clapper rail is listed as "Threatened" by the CDFG and "Endangered" by the USFWS; the California least tern is listed as "Endangered" by the USFWS and CDFG; the western yellow-billed cuckoo is listed as "Endangered" by the CDFG; the Arizona Bell's vireo is listed as "Endangered" by the CDFG; and the least Bell's vireo is listed as "Endangered" by the USFWS and CDFG.

Several other bird species are listed as "Threatened" by the CDFG, including Swainson's hawk, greater sandhill crane, California black rail, and bank swallow. The California black rail is also a Category 1 candidate for the federal "Endangered" species list, and the tri-color blackbird is





currently proposed for federal listing as either threatened or endangered. Agricultural areas in the County provide important habitat for species such as the sandhill crane, which utilizes wetland roosting areas between Brawley and Imperial (including portions of the Mesquite Lake SPA) and forages throughout the Valley.

The following raptors seen soaring over various habitats throughout Imperial County are considered sensitive due to an overall regional loss of foraging and nesting areas within southern California: golden eagle, prairie falcon, Cooper's hawk, sharp-shinned hawk, ferruginous hawk, Harris' hawk, osprey, northern harrier, American kestrel, turkey vulture, killdeer, long- and short-eared owl, and burrowing owl. Also, as primary carnivores, they are often more susceptible to changes in their environment. Twenty-four key raptor areas are managed by BLM on lands under its authority throughout the State.

## **Mammals**

Mammalian species of high interest occurring in Imperial County include the American badger, desert kit fox, Yuma mountain lion, and bighorn sheep. The peninsular bighorn sheep is currently proposed for listing by the CDFG as a "Threatened" species. None of these species, however, are listed as "Rare" or "Endangered" by either the USFWS or CDFG. Several species of bats are listed as "Species of Special Concern" by the CDFG, including the California leaf-nosed, Townsend's western big-eared, and California mastiff bats. These species and the pallid and spotted bats are also Category 2 candidates for the federal "Endangered" species list. Agricultural areas in the County provide foraging habitat for bats, which are attracted to fruit, fruit flies and drainage canals.

## **Habitats**

Sensitive habitats are those which are considered rare within the region or support sensitive plants or animals. Habitat values in the County vary due to differing levels of disturbance. Past disturbances from agricultural and recreational activities are the primary sources for reduced habitat values. Sensitive habitats of the County include desert riparian, fresh emergent wetlands (freshwater marsh), palm oases, and desert succulent shrub, and sand dunes. Although not considered sensitive, agricultural and other disturbed areas are often of significant value to certain animal species such as large mammals (e.g., foxes, coyotes and badgers), birds (e.g., sandhill crane), and raptors (e.g., burrowing owl) because they provide foraging opportunities.

In southern California, wetlands by their nature are limited, and in Imperial County they are extremely limited. They are also one of the fastest disappearing habitats in the State. Proximity to water, interface between a variety of habitat types, and vertical stratification of foliage are factors which contribute to the richness and productivity of wetlands. While a few wildlife species are restricted entirely to wetlands for all of their life requirements, many more are dependent on them for necessities such as food, cover, or breeding. Numerous other species also make extensive use of these habitats even though they may not be entirely dependent upon them. Due to their limited area and diminishing acreages, the occurrence of sensitive plants, and the ability to support a diversity of wildlife species, desert riparian and freshwater marsh habitats are considered sensitive in Imperial County.





Palm oases are sensitive due to their limited distribution and high wildlife diversity. Because they rely on permanent sources of water, these habitats are restricted to areas of moist alkaline soils near seeps, springs and streams around the Salton Sea basin. Desert succulent shrub habitats are sensitive due to the predominance of sensitive cactus species, such as foxtail cactus, crucifixion thorns, Munz's cholla, Wiggins' cholla, and giant Spanish-needle.

As mentioned, the sand dunes of south-central Imperial County contain many examples of rare and/or endangered plants, insects and animals that have adapted to the extreme arid conditions. These species include the Pierson's milk-vetch, Wiggins' croton, Algodones Dunes sunflower, Andrews' dune scarab beetle, and flat-tailed horned lizard.

Other important habitat areas in Imperial County include the Salton Sea, Colorado River, agricultural-related canals and drains, mesquite hummocks, and desert washes. These diverse and occasionally highly specialized communities constitute an important and valuable resource which will require protection if their long-term value is to be preserved.

## **C. Cultural Resources**

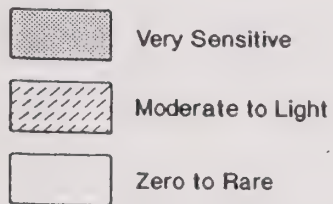
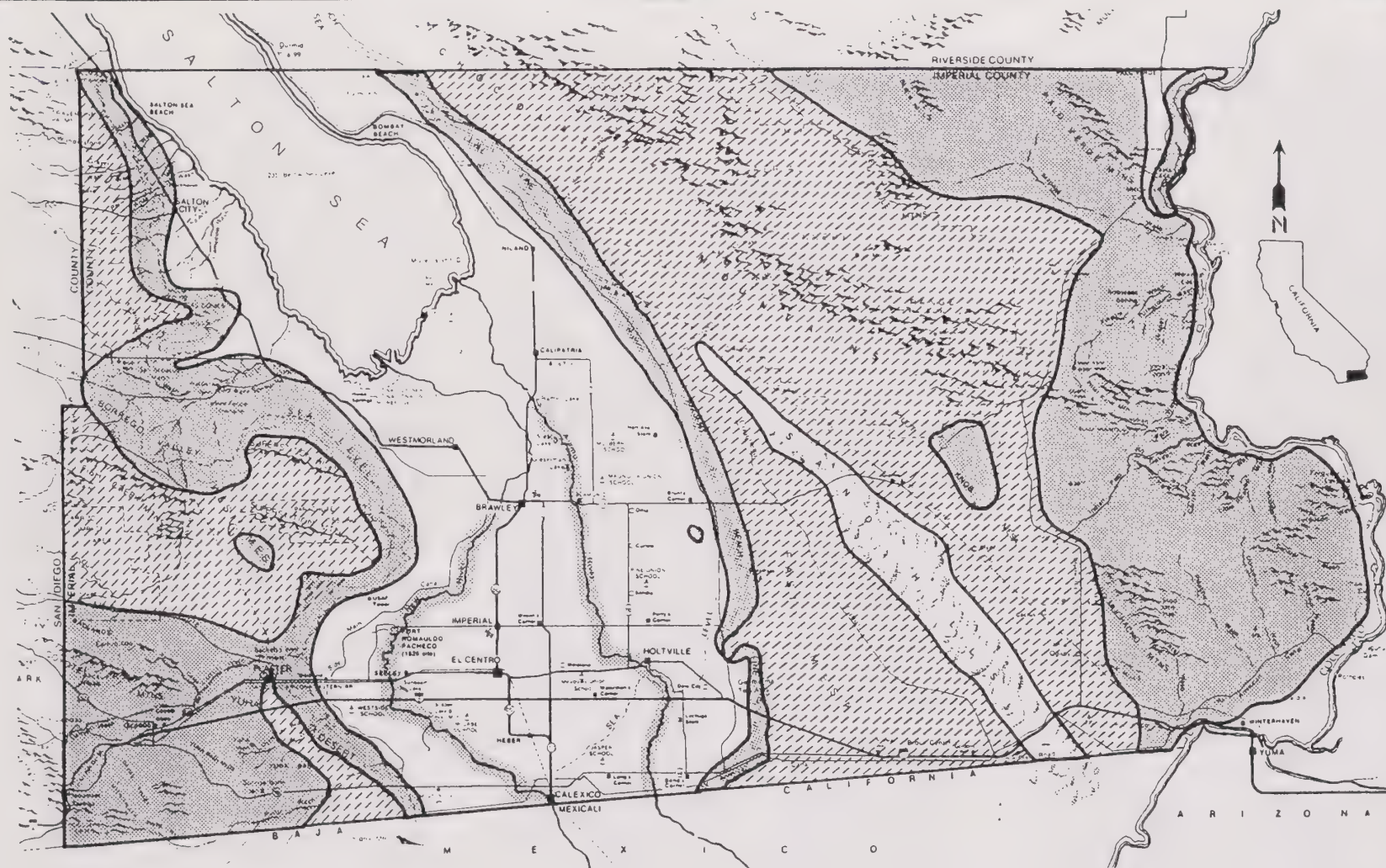
In Imperial County most archeological work can be separated into two distinct sections: prehistoric and historic. All prehistoric archeology deals with aboriginal culture and systems which existed prior to Spanish colonization in 1769. Historical archeology deals with uncovering facts that no known historical documentation has provided.

### **1. Prehistoric Resources**

Approximately 7,000 prehistoric archaeological sites have been recorded in Imperial County (Jay von Werlhof, personal communication). A wide variety of site types are represented including settlements, trails, rock art, geoglyphs, fish traps, and resource procurement and manufacturing locations. The current distribution and availability of such resources are a consequence of several environmental and historic factors. Environmental factors include the periodic flooding of ancient Lake Cahuilla and the existence of the New River and Alamo River, all of which encouraged prehistoric settlement and resource use in the vicinity of their shorelines and riverbanks. At the other extreme, an environmental feature that discourages the likelihood of finding prehistoric cultural resources is the Algodones Sand Dunes. From a historical standpoint, the intensive use of Imperial Valley for irrigation agriculture since the beginning of this century has impacted any resources that may have existed on land that is now farmland or under the Salton Sea.

A sensitivity map, prepared by Mr. Jay von Werlhof of Imperial Valley College for this Element, illustrates general areas that are very sensitive or moderately sensitive, and those areas not expected to contain prehistoric resources (Figure 4). As indicated in Figure 4, few highly sensitive resources exist within the major populated and developed portions of the County, and this is precisely the area that has been intensively farmed. The important exceptions in this area include the New River and the Alamo River which, as described above, were extensively utilized by the Kamia as late as the mid-1800s. Irrigation agriculture has also impacted sensitive resources that presumably existed near the community of Palo Verde.





0 6 12 miles



Imperial County  
General Plan

Sensitivity Map for Cultural Resources

Conservation and Open Space Element

Figure  
4







Other areas that are highly sensitive include the vicinities of the west and east Lake Cahuilla shorelines, lower Borrego Valley extending east to Highway 86, the southwesternmost portion of the County centered around Ocotillo, a portion of the Pilot Knob Mesa area east of Glamis, and the entire easternmost portion of the County including the Palo Verde Mountains and the area between Ogilby Road and the Colorado River. The only non-agricultural areas that are expected not to contain resources are the immediate east and west sides of the Salton Sea, and the Algodones Sand Dunes.

Areas that are moderately to lightly sensitive include most of the Chocolate Mountains and portions of East Mesa, West Mesa, the Fish Creek Mountains, and the Superstition Mountains. The lack of water and relative harsh terrain combined to discourage major use of these regions. However, significant resources have been found in these areas and additional archaeological research will undoubtedly lead to the discovery of others.

## 2. Historic Resources

Approximately 200 historic sites have been recorded in Imperial County (Jay von Werlhof, personal communication). Important historic resources date back to 1540, when the Hernando de Alarcon Expedition discovered Alta California from near the intersection of Interstate 8 and Highway 186 on the Colorado River (California Registered Historical Landmark No. 568). The next major historical event occurred in 1775 when Juan Bautista de Anza first passed through the area. The Anza Trail itself constitutes a significant cultural resource in the Yuha Desert, as does the later Sonoran/Southern Emigrant Trail which served as a major route to and from coastal California from 1825 to 1865. Although very few structures or artifacts may remain from the use of these trails, the routes themselves are of historical significance. As described in the *Current Land Use Plan for Yuha Desert Planning Area* (adopted March 20, 1973 by the Imperial County Board of Supervisors), the corridor of historic trails joining the Yuha Desert with, and passing through, the Anza-Borrego Desert State Park, represents an area "of such a nature as to be of State or National importance" (p. 4). Several historical markers have been established along the Anza Trail, including the monument of Los Puertecitos (California Registered Historical Landmark No. 635) near Highway 78 and Kane Springs Road.

Two additional significant resources that stem from the Spanish period (1769-1821) are the La Purisima Conception Mission site (California Registered Historical Landmark No. 350), located at Mission St. Thomas on Indian Hill, and the San Pedro Y San Pablo de Bicuier Mission site (California Registered Historical Landmark No. 921), located near Laguna Dam. The former was constructed in 1780 at the request of the local Indians, and the latter in January 1781 as a strategic settlement for those crossing the Colorado River. Both were attacked and destroyed on July 17, 1781 by the Quechans.

One of the few known historic sites from the Mexican period (1821-1848) is Fort Romualdo Pacheco (California Registered Historical Landmark No. 944). Located about seven miles west of Imperial near the New River, this fort was the only Mexican fort in Alta California, and was constructed to help maintain the Sonoran Trail. It was constructed in 1825 and attacked by the Kamia on April 26, 1826, resulting in the deaths of three soldiers and the fort's abandonment. Adobe walls about two



and a half feet high remained in 1968 but were leveled for agricultural purposes shortly thereafter. The site was excavated by Jay von Werlhof of Imperial Valley College in 1978.

Few sites remain from the early American period (1848 through the early 1900s), since little settlement and other use occurred until the availability of irrigation water in 1901. Most sites have been impacted by agricultural activities and the construction of towns. One American period site has received a historical monument for being the location where the first irrigation water entered the County. This monument is located a few feet from the U.S.-Mexican border on Barbara Worth Road, between Calexico and the Alamo River.

Another significant historic site is the Plank Road near I-8 along the Algodones Sand Dunes. Utilized from 1914 to 1927, this seven-mile long road has been dedicated as California Registered Historical Landmark No. 845. Other sites of local historical importance are described in *Imperial Valley Historical Markers* (Little 1982). In addition, plat maps of the early 1900s indicate numerous structures throughout Imperial Valley. Although many of these structures are no longer standing, there is a potential for the existence of subsurface features such as house foundations, privies, and trash deposits at these locations. Information from these sites could contribute to an understanding of early settlement in the County.

Locations of contemporary Native American importance include the Quechan Reservation in southeastern Imperial County and a portion of the Torres-Martinez Reservation in northwestern Imperial County.

#### D. Soils

The soils of Imperial Valley consist of silty clays, silty clay loams, and clay loams that have formed on nearly level old lakebeds and floodplain deposits. The soils are generally deep, highly calcareous, and usually contain gypsum and soluble salts. The central part of the County, which is irrigated, generally has fine textured silts. Sandy soils predominate in higher areas, such as the East and West Mesas, and are typical of most of the deserts in the southwestern United States. These soils do not have well defined horizons and are several thousand feet deep.

The federal Soil Conservation Service Soil Survey identifies ten major soil associations. The ten associations can be grouped by landscape:

East and West Mesas - There are four soil associations that dominate the East and West Mesas: Rositas, Rositas-Superstition, Antho-Superstition-Rositas, and Holtville-Antho. The topography of the East and West Mesas is nearly level to moderately steep. Soils on the East and West Mesas are generally well to excessively well drained. These soils are generally used for desert recreation or wildlife habitat. The soils tend to be unsuited for agriculture with the exception of a few areas of Rositas soils.

Lacustrine Basin - There are six soil associations that dominate the lacustrine basin: Imperial, Imperial-Holtville-Glenbar, Meloland-Vint-Indio, Niland-Imperial, Glenbar-Imperial, and Fluvauquents. The topography of the lacustrine basin is nearly level. Soils in the lacustrine basin are generally well drained to poorly drained soils. Soils in the basin are





mainly used for crop production through irrigation and constitute over sixty percent of Imperial County.

The primary conservation issue related to soils is salt accumulation. Salt accumulation in Imperial County is primarily the result of the high concentration of dissolved salt in irrigation water and the prominent clay component of the soils. Agricultural production is affected by salt accumulation in the soil. Specific crops vary in their sensitivity to salinity. The yield of some crops only declines by a few percentage points while other crops may totally fail in saline conditions.

## **E. Minerals**

A wide variety of minerals are found throughout Imperial County. Gold, gypsum, sand, gravel, lime, clay, and stone have the highest economic value and are presently extracted for profit in the County. Industrial materials are also readily available, including kyanite, mineral fillers (clay, limestone, sericite, mica, and tuff), salt, potash, calcium chloride, manganese, and sand. The managed use of the valuable mineral deposits is important for regional economic stability. It is also important to insure that adequate deposits remain for future generations.

Two general issues surround the extraction of minerals in Imperial County: land use conflicts and environmental impacts. The geographic extent of mineral resources is a function of geologic factors. As a result, mining operations are restricted to the relatively few locations where mineral deposits are suitable for extraction. Figure 5 depicts mining areas within the County. When these sites or the adjacent areas are developed, the imposition of mining operations often conflicts with the developed land uses. Extractive operations are particularly unwanted as neighbors by residential or commercial land uses. If mineral deposits are to be protected for managed use, the location, extent, and quality of deposits must be determined and land use plans must minimize development on and around valuable deposit sites.

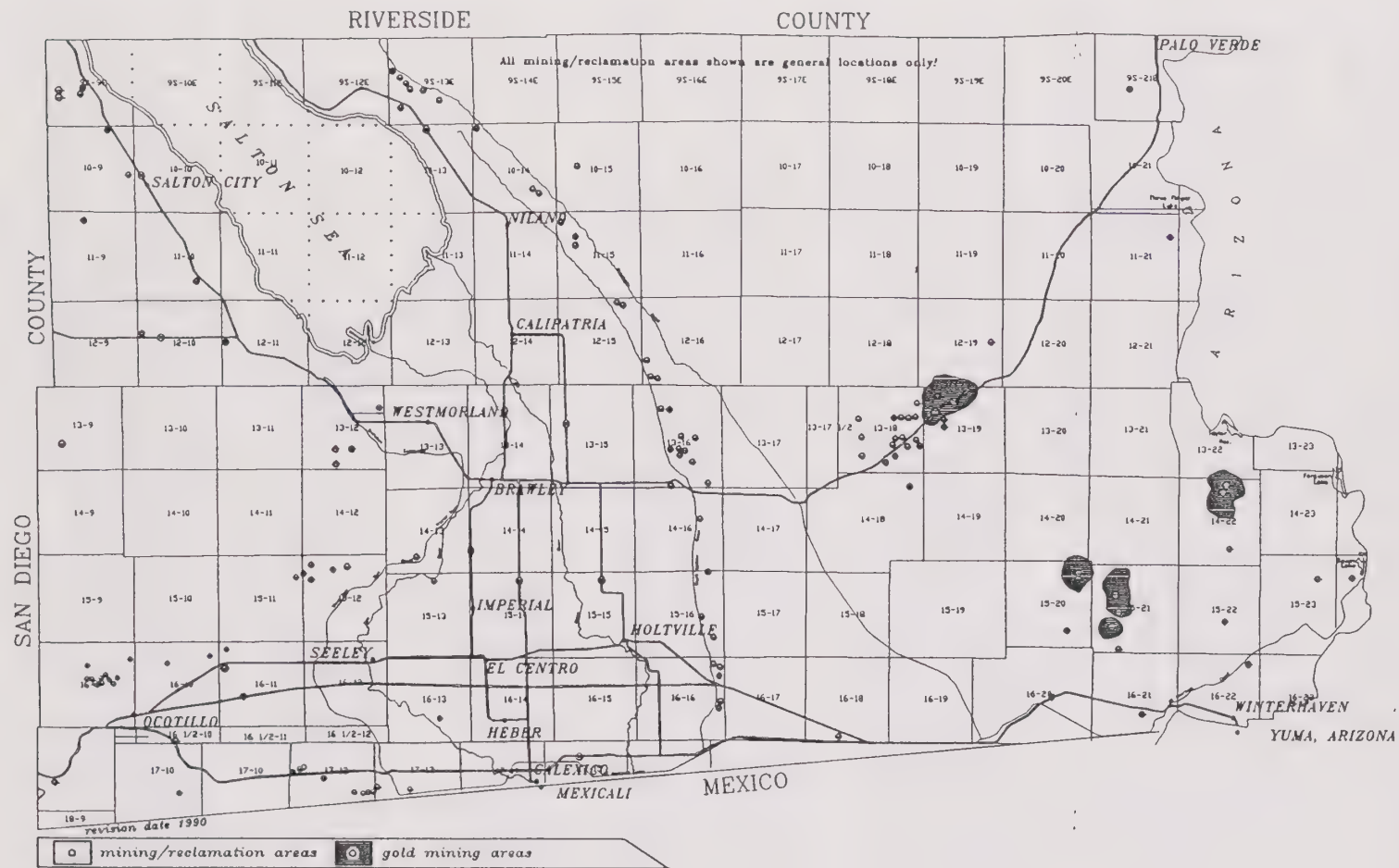
Mineral extraction operations can have significant impacts on environmental resources. Extractive operations can degrade air quality, generate noise, accentuate geologic hazards, pollute surface and groundwater, jeopardize public health and safety, destroy valuable cultural resources, alter the visual landscape, and impact sensitive wildlife and plant species. The Surface Mining and Reclamation Act (SMARA) requires mitigation of potentially adverse environmental impacts while insuring the continued supply of mineral resources for society.

## **F. Energy**

Energy is an essential component of all economic activity. Yet the majority of energy produced and utilized is harmful to the environment to some degree. Increasing public concern about the societal costs of pollution have focused government and industry attention on the connections between energy and the environment. Energy resources include fossil fuels (oil, gas, natural gas, petroleum, coal, etc.), the hydraulic force of water, geothermal fluids, nuclear energy, wind, biomass and solar energy, among others. Energy resources in Imperial County consist of the hydraulic force of water, geothermal fluids, and biomass. Geothermal supplies are not discussed here, because the subject is presented in a separate General Plan Element, the Geothermal and Transmission Element.







SOURCE: Imperial County Planning Department

Imperial County  
General Plan

Mining Resources

Conservation and Open Space Element

Figure  
5



In 1936, the Imperial Irrigation District (IID) entered into the electrical power business as a public utility. Prior to this, electric energy was accessible only to Imperial Valley residents who lived in the urban areas, at a very high rate. After construction of the All-American Canal, low cost hydroelectric energy became a by-product of the irrigation system available to Imperial Valley. As electrical needs have increased, IID has imported additional sources of energy to supplement the hydro-generated power.

For many years, the average consumption by residential customers of IID has been the highest in the southwest, and about thirty percent higher than the national average. The average residential customer uses 13,374 kilowatt-hours (kwh) annually, while the nationwide average is 9,229 kilowatt-hours (kwh) (1987). Much of this is due to the high use of air conditioning. IID serves most of Imperial County, except in the Palo Verde area where power is supplied by Southern California Edison (SCE). Imperial Irrigation District also supplies electricity to parts of San Diego County and Riverside County including the Coachella area.

IID operates nine hydroelectric generation plants, a 180-megawatt steam plant, eight gas turbines and an eight-unit diesel plant. The Coachella Valley Substation, placed in service in June 1986, is the key link between the IID and Southern California Edison. A 230-kV transmission line constructed in 1988 allows Imperial Valley access to the rest of the southwestern power grid, and establishes a strong path to export geothermal and other alternative energy (such as biomass purchased by SCE) from Imperial Valley.

The majority of urban air pollution is due to combustion of fossil fuels, particularly oil used in transportation. In addition, oil is a cause of concern about future energy prices and the security of the energy supply. Most of the oil in the United States is used in transportation. In California, three-quarters of the oil is used for transportation. We must cut our dependency on oil by producing energy with alternatives to fossil fuels. The greatest opportunities for substituting cleaner fuels for oil in the near future exist with natural gas.

There are no known available fossil fuel reserves in Imperial County. IID imports these fuels for use at the El Centro Steam Plant, the Brawley Diesel Plant, Rockwood Plant and Coachella Station. In 1988, approximately sixty-two percent of electricity generated by the Imperial Irrigation District was with the use of imported fossil fuels.

Power generated by the hydraulic force of water is a relatively low cost means of generating electrical power with minimal adverse impacts on the environment when the resource is available. In normal rainfall years, nearly sixteen percent of California's electrical generating capacity comes from hydropower.

The first hydroelectric plants on the All-American Canal were completed at Drops 3 and 4, in 1941. The hydroelectric facility at Drop 2 was installed in 1953. The Pilot Knob Plant was built on a bypass channel between the All-American Canal and the Colorado River, and went into operation in 1957. The Drop 5 installation was completed in 1982, the Drop 1 and East Highline Turbomant Hydro Plants were opened in 1984.





Imperial County has to date approved development of two power plants to generate 33 MW (gross) of electricity with use of agricultural waste products. The plants are located together north of the City of Imperial in an area of the County designated for heavy industrial uses, on the west side of Highway 111, south of Keystone Road.

Mesquite Lake Resource Recovery Project is the world's first commercial-scale power plant to use cattle manure as fuel, designed to produce 15 MW. The County issued a Conditional Use Permit for the project on July 3, 1985. The plant came on line in mid-July 1989.

Environmentally, the plant provides several benefits to the County. It generates as much power as would be derived from the burning of 350,000 barrels of oil each year, thereby reducing fossil fuel consumption. The project will use approximately 260,000 tons of cattle manure each year, about half of the amount produced by cattle feedlots in the Imperial Valley. The plant converts a waste disposal problem into a natural fertilizer from the ash formed in the combustion process. The ash is free of insects, bacteria and weed seeds. The company is investigating alternative uses for the ash such as paving material, hazardous waste binder, landfill cover soil amendment, and geothermal brine binder.

The second plant, Imperial Resource Recovery Project, was approved to use a combination of wood waste, manure, and crop residues (wheat, straw, cotton stocks and Bermuda Grass Straw). This plant should contribute to a slight decrease in overall local air quality, since much of these wastes are now being burned in open fields. The plant capacity is 15.35 megawatts (net), and in full operation will produce 117 million kilowatt hours/year for sale to SCE, transmitted by the 230 kilovolt transmission line from Heber to Coachella. The waste fuel is burned to create hot flue gas from which heat is recovered to generate steam in a waste heat boiler.

An extensive source of energy is available in Imperial County in the form of sunlight or solar. Photo-voltaic cells power a variety of items from calculators to remote telecommunications stations and water pumps. It has been estimated that solar power could eventually produce ten percent of the United States energy supply. No commercial power generation of solar energy presently exists in the County.

## **G. Regional Aesthetics**

Imperial County contains a wealth of scenic visual resources. These visual resources include desert areas, sand hills, mountains, and the Salton Sea.

The desert areas include the Yuha Desert, the West Mesa, lower Borrego Valley, East Mesa, and Pilot Knob Mesa. The Yuha Desert is located in the southwest portion of the County and can be viewed from Interstate 8. The Yuha Desert contains unique geologic features including sand chimneys and painted gorge formations. These features add beauty to this natural landscape. The barren landscape contrasts starkly against the backdrop of mountains. Other scenic deserts include the West Mesa area, which is bordered on the east by the Algodones Sand Dunes, the lower Borrego Valley, the East Mesa and Pilot Knob Mesa.



The Algodones Sand Dunes cover approximately 160 square miles stretching about 40 miles in width. They extend lengthwise in a northwest by southeast direction, and are situated between East Mesa and Pilot Knob Mesa. Consisting of shifting sands, the dunes attain a thickness of at least 200 feet in their central parts. The dunes played a major role in early exploration, travel, and development in Imperial County. They are currently bisected east/west by Highway 78 between Brawley and Glamis, and by Interstate 8 between El Centro and Yuma. These dunes represent a unique visual resource of Imperial County.

Mountains make up another significant visual resource of Imperial County. On the west side of the County are the eastern foothills of the Peninsular Range. These foothills include the In-Ko-Pah or Jacumba Mountains, the Coyote Mountains, the Fish Creek Mountains, and in the northwesternmost corner, the Santa Rosa Mountains.

The Chocolate Mountains, so named because of their dark color, are located in the northeastern portion of the County, stretching northwest by southeast between Riverside County and the Colorado River. They are bisected by Highway 78 between Glamis and the Palo Verde area. These mountains reach an elevation of 2700 feet, and are highly visible from throughout the County. They are extremely rugged, virtually undeveloped, and used as a Naval Gunnery Range.

Prominent landmarks visible from much of Imperial County are the Superstition mountains and Superstition Hills located in the west Mesa area, southeast of lower Borrego Valley and west of Westmorland and Brawley. These are clearly visible looking north from Interstate 8, west of El Centro, and from Highway 86 between El Centro and the Salton Sea. Perhaps the most significant landmark in the County is Mount Signal, located along the International Border on the eastern edge of the Yuha Desert, west of Calexico. This feature is visible from the entire Imperial Valley.

The Picacho State Recreation Area contains some prominent visual resources as well. Unique scenic values are created by volcanic formations and El Picacho itself, rising several hundred feet from the valley floor.

## **H. Air Quality**

Clean air is a valuable and essential resource which affects many aspects of our daily lives. It is vital to our health and welfare, to the local agricultural economy, and to the quality of life enjoyed by Imperial County residents. The capacity of the air to absorb environmental contaminants is limited however, and must be managed wisely to avoid significant deterioration of the resource.

### **1. Climatic Conditions**

The Imperial Valley experiences clear skies, very low humidities, extremely hot summers, mild winters, and little rainfall. These climatic conditions are strongly influenced by the large-scale sinking and warming of air in the semi-permanent subtropical high pressure center of the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms, except in winter when the high is weakest and farthest south. The coastal mountains also have a major influence on climatic conditions by blocking the cool, damp marine air found in the California coastal environs. The flat





terrain of the valley and the strong temperature differentials created by intense solar heating produce moderate winds and deep thermal convection.

The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation. Rainfall is highly variable with precipitation from a single heavy storm one year exceeding the entire annual total during a following drought year.

Average humidities range from 28 percent in summer to 52 percent in winter. A large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidities rise to 50-60 percent, but drop to about 10 percent during the day.

High winds are occasionally experienced in the Imperial Valley. Wind speeds in excess of 31 miles per hour occur most frequently in April and May. On an annual basis, strong winds (greater than 31 miles per hour) are observed 0.6% of the time; speeds of less than 6.8 miles per hour account for more than one-half of the observed winds. The prevailing winds are from the west-northwest through southwest. Secondary flow is observed from the southeast.

## **2. Air Quality Standards**

Over the past several decades, both the state and federal governments have set and periodically revised ambient air quality standards for pollutants that are of greatest public health concern. These standards encompass the most common varieties of airborne materials which can pose a health hazard. Pollutants with ambient standards remain the chief focus of air quality management activities around the nation. Air quality standards are typically set at levels which provide a reasonable margin of safety and protect the health of the most sensitive individuals in the population.

Pollutants for which ambient standards have been established based on the criteria studies mentioned above are known as 'criteria pollutants'. Criteria pollutants include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM<sub>10</sub> (a general category of airborne particles 10 microns or less in diameter), and lead, a specific particulate pollutant. California has also set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. Different standards for these and other pollutants have been set by California and other states. California standards tend to be more restrictive than national standards, and are based on objective health and welfare concerns.

Monitoring of ambient air quality in Imperial County began in 1976. Since that time, monitoring has been performed by the Imperial County Air Pollution Control District (APCD), the Air Resources Board (ARB), and by private industry. Ambient monitoring is typically performed either in locations representative of where people live and work, or near industrial sources to document the air quality impacts of those facilities. As of March, 1991, nine public agency and private sector monitoring stations were in active service in the county.

## **3. Local Pollutant Measurements**

Pollutant levels at any one location vary widely over time. As a result, air monitoring produces highly diverse data. While not always representative of overall existing conditions, the highest levels of pollutants observed at a location are used for evaluating compliance with air quality standards.





State standards for ozone and PM10 are currently exceeded within the Imperial County Air Pollution Control District, and violation of federal standards will occur in future years without adequate planning and air quality management.

Numerous agencies with direct and indirect interest in air quality participate in the planning process. The Environmental Protection Agency (EPA) administers the federal Clean Air Act and other air quality related legislation. The federal Clean Air Act requires EPA to approve state implementation plans. The California State Implementation Plan (SIP) is comprised of plans developed at the regional or local level. Each of these plans is individually reviewed and approved by EPA prior to incorporation into the SIP.

The California Clean Air Act (CCAA), signed into law in September of 1988, requires all areas of the state to achieve and maintain the California ambient air quality standards by the earliest practicable date. These standards are generally more stringent than the federal standards.

The ARB has designated all air pollution control districts as attainment or nonattainment for each state air quality standard. Nonattainment designations are to be further categorized into three levels of severity: "moderate" (can demonstrate attainment by 1994); "serious" (can demonstrate attainment by 1997); and "severe" (cannot demonstrate attainment until sometime after 1997).

Under the CCAA the ARB and the air pollution control districts share primary responsibility for improving air quality. The extent of the planning effort to control air pollution within a district depends upon the severity of the air pollution problems within the district. Although formal severity classifications have not yet been made, Imperial County is expected to fall within the "moderate" attainment category for ozone, and is required to implement the following:

- A permitting program designed to achieve no net increase in emissions of nonattainment pollutants or their precursors from new or modified stationary sources which emit or have the potential to emit 25 tons per year or more of nonattainment pollutants or their precursors (Health and Safety Code 40918(a) (1)).
- Reasonably available transportation control technology for all existing sources (Health and Safety Code 40918(a) (2)).
- Reasonably available transportation control measures (Health and Safety Code 40918(a) (3)).
- Provisions to develop area source and indirect source control programs (Health and Safety Code 40918(a) (4)).
- Provisions to develop and maintain an emissions inventory system to enable analysis and progress reporting and a commitment to develop other analytical techniques to carry out its responsibilities pursuant to Health and Safety Code Section 40924 subdivision (b).
- Provisions for public education programs to promote actions to reduce emissions from transportation and areawide sources (Health and Safety Code 40918(a) (6)).



The 1991 Air Quality Attainment Plan for Imperial, prepared by the Imperial County Air Pollution Control District (April 14, 1992) is designed to meet these requirements. The APCD shares responsibility with ARB for ensuring that all state and federal ambient air quality standards are achieved and maintained within the County. State law assigns primary responsibility for control of air pollution from stationary sources to local districts, while reserving an oversight role for the ARB. Generally, the districts must meet minimum state and EPA program requirements; in most instances, districts can implement more stringent regulations than EPA or the State require. The District is also responsible for the inspection of stationary sources, monitoring of ambient air quality, and planning activities such as modeling and maintenance of the emission inventory. Districts in state nonattainment areas are also responsible for developing and implementing transportation control measures necessary to achieve the state ambient air quality standards.

## **I. Open Space**

Open space is a valuable resource in any community or county experiencing urbanization. The value of open space to Imperial County includes shaping the overall urban form, providing outdoor opportunities, enhancing and protecting scenic vistas, ensuring public health and safety, preserving valuable natural resources, and providing areas to manage the production of resources.

Open space is considered here in its broadest terms as any parcel or area of land or water which is essentially unimproved and devoted to one or more of the following categories of uses:

- Preservation of Natural Resources
- Managed Production of Resources
- Outdoor Recreation
- Protection of the Public Health and Safety

The Open Space section is intended to provide for the integration of functional open spaces into the land uses identified in the updated Land Use Element. The timely identification and preservation of open space lands is intended to discourage their premature or improper conversion to intensive urban uses. Open space land approved to be utilized for intensive urban uses is irretrievably lost.

Open space areas within Imperial County may be large expanses, long corridors, or small parcels. The state and federal governments also hold large open space areas within the County, the largest being the California Desert Conservation Area, maintained by the Federal Government under the jurisdiction of the Bureau of Land Management. The second largest federal land holding in the County is the U.S. Department of the Navy's Yuma Marine Air Station. The State has certain jurisdiction over open space areas in the Cargo Muchacho Mountains and other areas along the Salton Sea.

Open space corridors generally follow natural features such as stream courses or ridge lines. These linear features are valuable because they emphasize natural resource conservation, natural habitat preservation, scenic vista enhancement, and recreational opportunities.

Likewise, open space may be held in small parcels. These parcels are primarily held by individuals or homeowner associations. These acreages, valuable in their aggregate and scenic recreational





attributes, generally do not meet open space size criteria. Open space areas in the program, with a large area or corridor can be publicly or privately owned and maintained. The County owns and maintains large open space areas such as the Wiest Lake Park and Sunbeam Lake Park.

It is assumed that the military holdings within the County will continue for the foreseeable future. The military leases substantial areas of the land from the Bureau of Land Management and agencies for training and experimental operations. Certain areas have been designated as inaccessible to the general public under any conditions. Aerial parachute drops and gunnery and bombing practice sites constitute a threat to the public health and safety in these areas. Additional areas are restricted for security reasons. Portions of the military lands may be open to the public, such as for Off-road Vehicle (ORV) use, on a controlled and restricted basis, with the military retaining the right to deny or cancel recreational uses when emergency or priority operations are necessary. The County has no regulatory authority over these lands, and if controlled recreational use is permitted, it will be subject to the management procedures imposed by the Bureau of Land Management.

## **1. Open Space for the Preservation of Natural Resources**

The Preservation of Natural Resources section, includes but is not limited to:

- areas required for the preservation of plant and animal life including habitat for fish and wildlife species;
- areas required for ecologic and other scientific study purposes;
- rivers, streams, bays, and estuaries; and
- coastal beaches, lakeshores, banks of rivers and streams, and watershed lands.

Imperial Valley possesses some of the most unique natural habitats, geologic formations, and archaeological sites in the southwest. The value of these resources has in certain instances been recognized. The dependence of plants and animals on the preservation of unique habitat areas illustrates the fragile ecological balance that has developed in the desert. Interruption of this ecological system endangers the existence of irreplaceable natural resources. The costs of interaction are becoming increasingly apparent. Loss of marshland habitat and the available food supply have reduced waterfowl numbers; archaeological sites are damaged; and even the rare giant Intaglio in the Yuha Desert area is being thoughtlessly destroyed.

## **Protected Areas - National Wildlife Refuges**

Most of the protected areas are under the authority and management of State or Federal Agencies. The existence of open space lands included in these areas is assumed to continue.

Located near the southern end of the Salton Sea, the Salton Sea National Wildlife Refuge provides winter habitat for migratory waterfowl along the Pacific Flyway. Numerous rare and endangered species, as well as resident waterfowl, utilize the area, providing opportunity for birdwatching and



photography. Originally, the refuge consisted of approximately 36,526 acres, however, all but about 2,200 acres are submerged.

Situated along the Colorado River in the Lower Colorado Valley, the Imperial National Wildlife Refuge covers approximately 25,765 acres. The portion of land in Imperial County is about 7,958 acres, all of which has been preserved as natural habitat. The refuge serves migratory waterfowl of the Pacific and Central Flyways, notably Canadian Geese. It provides protected habitat for many endangered animal types. These include the bighorn sheep, burro deer, Yuma mountain lion, Yuma clapper rail, and several species of migratory waterfowl. The narrow dense growth of marsh and brush vegetation along the river supports abundant small animal life. The refuge is open to the public and a visitor center is open Monday through Friday. Recreational use is primarily associated with boating and water activities to the south on the Arizona side. Red Cloud Road serves the area with five lookouts, and a one mile hiking trail is open to the public. Seasonal hunting is also permitted.

Located along the Colorado River adjacent and directly north of Imperial National Wildlife Refuge, only a small portion of the Cibola National Wildlife Refuge is located in Imperial County. Primarily riverine, it protects much of the same wildlife types as the nearby Imperial National Wildlife Refuge. The area is open for limited seasonal hunting and recreational use primarily on the north end, or Arizona side.

### **Protected Areas - State Wildlife Management Areas**

The California Department of Fish and Game manages two Wildlife Areas in Imperial County. Both areas provide habitat for migratory waterfowl and reduce depredation of surrounding croplands.

Located near the southern end of the Salton Sea, the Imperial Wildlife Management Area is predominantly low lying marshland serving the purpose of reducing crop depredation and open for seasonal hunting. The area consists of two sites:

Finney - Ramer Unit. This unit consists of 2,047 acres preserved in natural habitat. It was originally established as a duck refuge. Four lakes are included in this unit. The lakes are: Lower Ramer Lake, 160 acres; Upper Ramer Lake, 62 acres; Lower Finney Lake, 84 acres; and Upper Finney Lake, 20 acres. The area was originally purchased and developed by the Bureau of Reclamation as a mitigation measure in the development of the Coachella Canal.

Wister Unit. This unit consists of 5,243 acres and 2,000 acres leased from the Imperial Irrigation District, which is preserved in natural habitat and supplemented with grains such as wheat, milo, barley, rye and grass.

The Hazard Unit consists of 535 acres leased to the U.S. Fish and Wildlife Service, and is managed along with the Salton Sea National Wildlife Refuge.

The Julian Wash Wildlife Management area consists of 485 acres, adjacent to the Colorado River, preserved in natural habitat. It provides sanctuary to many of the same plant and animal species as the nearby Imperial National Wildlife Refuge.





Located generally between the eastern edge of the Imperial Valley agricultural region and the Southern Pacific Railroad, lie the Algodones Sand Dunes. These sand dunes are the most extensive in California, rising to heights of over 300 feet above the surrounding desert floor. This dune system extends more than forty miles in length, in a band averaging five miles in width and provides excellent educational and recreational opportunities. Formed by the windblown beach sands of ancient Lake Cahuilla, the dunes are habitat for a range of rare plants and animals, picturesque scenery and playgrounds for Off-Road Vehicles. In order to preserve a portion of the dunes in an undisturbed state and to protect sensitive plant and animal species, the Bureau of Land Management established the Algodones Outstanding Natural Area in the dunes immediately north of State Highway 78. The same areas have been designated a National Natural Landmark by the National Park Service. The dunes are under Bureau of Land Management jurisdiction and their California Conservation Desert Plan uses an integrated approach to management policies which considers the total natural resource base.

Off-road vehicle activity is permitted on more than eighty percent of the sand dunes, or over 142,000 acres. The three primary areas are Mammoth Wash (located at the north end of the dunes), Glamis Gecko (located just south of State Highway 78), and Buttercup Valley (located just south of Interstate 8 near the Mexican Border).

Organized, competitive or commercial off-road vehicle events such as sand drags, closed-course racing and hill climbs, are sometimes conducted in the dunes under a Special Recreation Use Permit from the Bureau of Land Management.

San Sebastian Marsh is a unique, water based habitat along San Felipe Creek has supplied a permanent, dependable source of water for people and wildlife since ancient times. The marsh, home to a variety of plants and animals, is the only designated critical habitat in California for an endangered species, the desert pupfish.

Because of its importance in sustaining this unique marshland environment, San Felipe Creek is a registered National Natural Landmark. The Bureau of Land Management has designated the San Sebastian Marsh as an Area of Critical Environmental Concern (ACEC).

One of Imperial County's most significant natural areas is the Yuha Desert. Its value as an area rich in archaeological, paleontological, and botanical information has been long recognized. Despite its barren appearance, the Yuha Desert today is home to many animal and plant species, specially adapted to its harsh environment. The Bureau of Land Management designated 40,622 acres of the Yuha Basin as an Area of Critical Environmental Concern in 1980. The Bureau of Land Management has sought to develop a management program which will protect sensitive natural and cultural resources, while providing for a range of uses from sand and gravel mining to recreational use.

Water bodies or flowing rivers or streams are usually important recreational and aesthetic resources, particularly in the arid southwest. The New and Alamo Rivers are presently unsuitable for water contact recreation and serve to transport irrigation drainage to the Salton Sea.





The Colorado River and Salton Sea are water resources which are of regional importance. The Colorado River and Salton Sea possess productive fisheries and other water oriented developments and recreation related opportunities. The salinity of the Salton Sea has risen significantly in recent years, and threatens the continued existence of the fishery. If adequate measures are not taken to halt or reverse this process, it may not sustain the fishery in the near future. The character of the Lower Colorado River has also been radically altered by the regulation of its flow for flood control, hydroelectric development, and other diversionary purposes.

## **2. Open Space for the Managed Production of Resources**

The Managed Production of Resources includes but is not limited to:

- forest lands, range land, agricultural lands, and areas of economic importance for the production of food or fiber;
- areas required for recharge of ground water basins;
- bays, estuaries, marshes, rivers and streams, which are important for the management of commercial fisheries; and
- areas containing major mineral deposits, including those in short supply.

Imperial County, while not experiencing the rapid urban development characteristics of the coastal counties, is slowly losing prime agricultural lands to rural subdivisions and annexations to cities for urban uses. Agricultural Land Resources are depicted on Figure 6. Recognition of the importance of preserving this nonrenewable resource has prompted the development of certain goals and objectives. The utilization of mineral and quarry resources, while not of such critical concern, does warrant attention for the purpose of assuring their continued use.

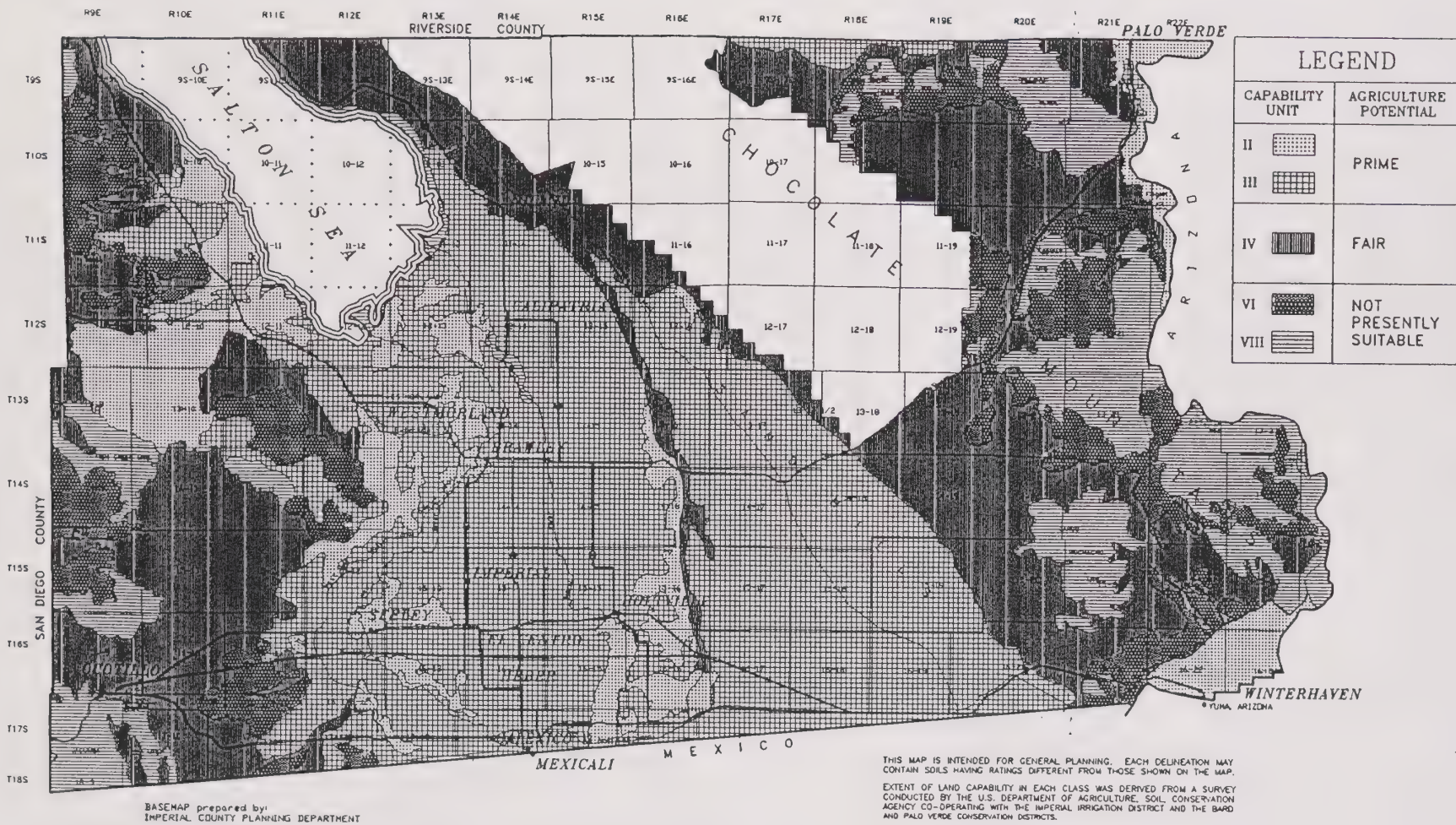
Climate and topographical features impose certain restraints upon the type of land suitable for cultivation in Imperial County. There are approximately 740,000 acres of land suitable for intensive irrigation farming, however, at the present time approximately 450,000 acres are irrigated. The potential irrigatable lands present a valuable future resource which should be protected.

Obviously, not all land is suitable or desirable for agricultural uses. To determine the location and extent of agricultural lands, lands have been mapped and classified according to their agricultural capability (see the Agricultural Element for further information on these lands).

The preservation of prime agricultural lands is beneficial to the public at large and adopted policies should encourage this end. The identification and preservation of prime agricultural farmland, based upon soil characteristics, crop types, and water supply should provide the foundation for a rational and defensible preservation program.







SOURCE: Department of Conservation  
Soil Conservation Service

0 6 12 miles



Imperial County  
General Plan

Agricultural Land Resources

Figure  
6

Conservation and Open Space Element





Imperial County is situated over an area possessing extensive geothermal resources. Imperial County encourages the exploration and development of geothermal resources. The Geothermal Overlay Zone permits geothermal development and production of electrical energy in all areas to which it is applied. For more information, please see the Geothermal and Transmission Element of the General Plan.

Extractive lands are primarily open and are used to withdraw natural resources from the earth such as minerals, sand and gravel, and clay. Extractive operations, though open, are often unsightly when viewed from a public right-of-way. The adoption of development and performance standards for the purpose of minimizing negative environmental impact is necessary.

The State of California (Caltrans) and the County Department of Public Works utilize several sand and gravel quarry sites throughout the area, essentially in unpopulated locations. The continued use of these sites is recognized. The sites indicated are not to be considered exclusive. Additional sites and areas may be utilized for extractive purposes providing such use is consistent with the provisions of the Imperial County General Plan and regulatory devices adopted to implement it. Unless specifically stated, the identification of mineral resources in a particular area does not necessarily require that extraction be permitted, however their presence should be considered if conflicting land uses are proposed.

### **3. Open Space for Outdoor Recreation**

Outdoor Recreation, includes, but is not limited to:

- areas of outstanding scenic, aesthetic, historic and cultural values;
- areas particularly suited for park and recreation purposes; including access to lakeshores, beaches, rivers, and streams; and
- areas which serve as links between major recreation and open space reservations, including utility easements, banks of rivers and streams, trails and scenic highway corridors.

Californians are a recreation minded people; and their mobility requires that recreational requirements be viewed from a regional perspective. This is the result of favorable climate, varied natural recreation opportunities, increased incomes, and more leisure time. Imperial County's sand dunes, deserts, the Salton Sea, the Colorado River, and sunny climate attract an ever increasing number of users from within the County and the nearby metropolitan areas. The New River and the Alamo River serve as potential resources for water activities, but in their present state would jeopardize public health and safety.

Natural resources are the primary determinants of outdoor recreation. Included are climate, geologic character of the land, water features, flora, and fauna. These characteristics are supplemented by significant historic and cultural factors. The extent of the natural resources available, or the historic or cultural value placed upon a specified area will determine the location and degree of recreational development.



A significant portion of Imperial County is held by the Federal Government and controlled by the Bureau of Land Management. The Department of Interior's Lower Colorado River Land Use Plan attempts to provide for future recreation demand while preserving and protecting wildlife, plant life, and unique geological formations along the river. The plan is a program for long range development formulated jointly by Federal, State, and local government agencies. It does not establish definite commitments to be implemented at the present time.

Many open space areas that are home to valuable natural resources also provide recreation areas. Included in this category are the Algodones Sand Dunes and the Wildlife Refuges that have been discussed in the previous section.

Some military lands are suitable for recreational uses during non-operational hours. Subject to Navy and Bureau of Land Management approval, the County encourages these to be open to the public on designated weekends and during specific hours.

Located along a seven mile stretch of the Colorado River, the Picacho State Recreation Area provides natural riverine habitat for many of the same plant and animal species as Imperial National Wildlife Refuge. Unique scenic values are created by volcanic formations and El Picacho itself, rising several hundred feet from the valley floor. The State of California is considering designating the area as part of the State Park System.

A small portion of the Anza-Borrego State Park is located in Imperial County, including the Carrizo Impact Area. The Carrizo Impact Area is not open to public use as decontamination of all active ordnance cannot be guaranteed. The remaining park area provides unique geologic formations, as well as habitat for Nelson - Peninsula bighorn sheep. The California Department of Parks and Recreation is considering expansion of the park.

The Salton Sea State Recreation Area is located along fifteen miles of the northeastern shoreline of the Salton Sea. It provides water oriented recreation, picnicking, camping, and wildlife opportunities, as well as access to the Salton Sea fishery. Many of the recreational facilities provided in the Salton Sea area are privately owned and developed.

Imperial County provides parks and recreational facilities intended to serve as wide a range of interests as possible. Emphasis is placed upon family oriented opportunities, as well as those that encourage visitor use. County recreation facilities include:

Sunbeam Lake  
Red Hill Marina  
Niland Marina  
Heber Beach Sand Dunes

Wiest Lake  
Palo Verde Marina  
Walker Roadside Park

The provision of adequate recreation facilities to meet increased demand is handicapped by the limited financial capacity of Imperial County. Their use by a large non-resident population illustrates the regional importance of these desert recreation resources.





The Imperial Irrigation District operates the system of canals that supply domestic and irrigation water to the County. Certain of the irrigation canals possess significant potential for recreational uses including fishing, picnicking, bicycle and/or equestrian paths in areas near or adjacent to urban areas. If the problems of vandalism and liability could be overcome, the Imperial Irrigation District canal system could provide prime recreational sites at specified locations within the County. Joint development of these facilities would concentrate the uses and reduce the unauthorized fishing that presently takes place.

Utility corridors present both opportunities and problems to the protection of open space. High voltage transmission lines are very evident in arid areas, and often seriously distract from views of the landscape. Measures must be taken to mitigate this negative impact.

#### **4. Open Space for the Protection of Public Health and Safety**

Public Health and Safety includes but is not limited to:

- areas which require special management or regulations because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, floodplains, watersheds, and areas presenting high fire risks;
- areas required for the protection of water quality and reservoirs; and
- areas required for the protection and enhancement of air quality.

California has experience with the loss of life and property associated with development in hazard prone areas. Legislation has required local action to provide for the increased safety of residents from natural disasters such as floods, landslides, or earthquakes. Strict structural requirements have been the result of public demand for greater safety from the danger of earthquakes. While legislation will not guarantee against loss of life or destruction, rational development policies will minimize the dangers. Figures 7, 8, and 9 depict flood prone areas, areas of landslide activity, and areas of erosion activity, respectively.

#### **Geologic Hazards**

Although located in the inland desert valley, Imperial County experiences periodic flooding. The Salton Sea was created in an unusual winter flood in 1905. A more common problem in the region of the southwest is "flash floods" which may originate many miles away in mountains or foothills. These floods often consist of a wall of water several feet high which may approach without warning into narrow washes, and presents an extreme danger to anything in its path.

The legality and desirability of flood plain zoning has been established by the State Legislature in the Cobey-Alquist Flood Plain Management Act. This act proposes a two district mapping system, the "floodway" or high velocity flow area, and the "restrictive zone", the low velocity area of the outer flood plain. A more detailed discussion of flood hazards and policies can be found in the Seismic and Public Safety Element.





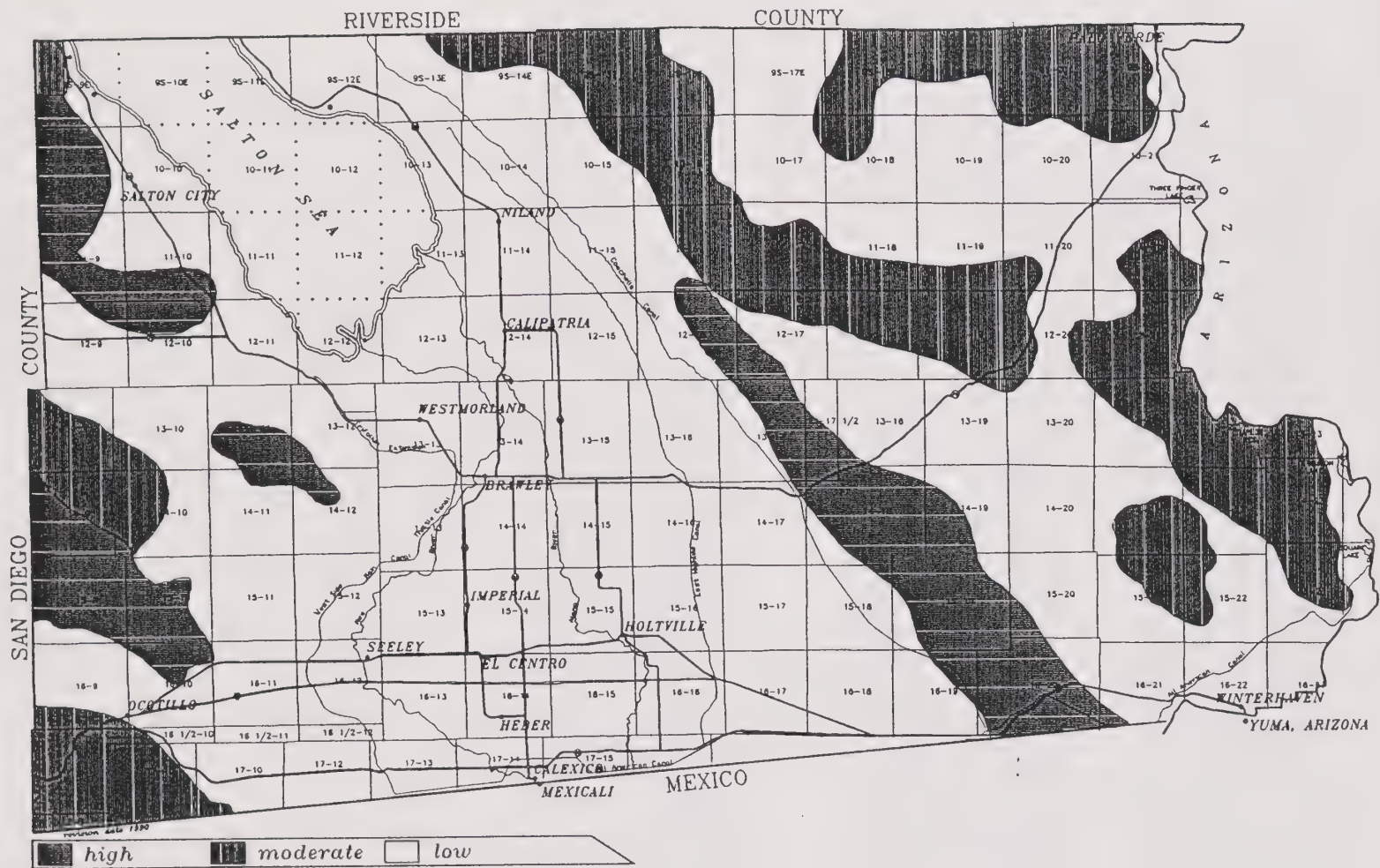




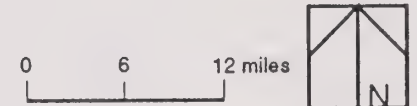








SOURCE: Department of Conservation  
Division of Mines and Geology



Imperial County  
General Plan

Erosion Activity

Conservation and Open Space Element

Figure  
9



Imperial County is situated in a seismically active area which in some places may be identified by surface alterations. The Imperial, Superstition Hills, and Superstition Mountain Faults are part of the active San Jacinto Fault Zone.

The protection of public health and safety in areas of severe earthquake hazard requires an extensive analysis of the local geology. The Alquist-Priolo Special Studies Zones Act went into effect March 7, 1973. The purpose of the act is to prohibit the location of most structures for human occupancy across the traces of active faults and to thereby mitigate the hazard of fault ruptures. The County Planning/Building Department has on file for public use, a set of 18 maps prepared by the State of California identifying Special Study Zones delineated in compliance with Chapter 7.5, Division 2, of the California Public Resources Code.

The County of Imperial encourages that land identified as being within a "Special Study Zone", designated by the State Geologist to be maintained as open space, to the maximum extent possible. A more detailed discussion and policies are contained in the Seismic and Public Safety Element.

The identification of unstable soils, such as soils subject to subsidence, and shrink swell, is also an important consideration in establishing standards for the protection of the public health and safety. A detailed discussion of this subject is contained in the Seismic and Public Safety Element.

### **Airport Flight Zones**

Countywide aircraft facilities are identified in the Airport Land Use Compatibility Plan. Aircraft accidents are most prevalent in areas immediately adjacent to airports and primarily occur during takeoff and landings. The area of highest risk potential is at the end of runways where forced landings generally occur. Since Imperial County is the host for the El Centro Naval Air Facility, Imperial County Airport and other airports adjacent to urban areas, it is essential that the County develop and maintain techniques which protect people and property from aircraft accidents. A more detailed discussion is contained in the County's Airport Land Use Compatibility Plan.





### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Conservation and Open Space Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing policies to conserve the natural environment of Imperial County. This section of the Element presents Imperial County's Goals and Objectives relative to planning for the natural environment of the unincorporated areas of the County.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statement that shall provide direction for private development and industry as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for decision making relative to proposed projects and land use planning. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Conservation of Environmental Resources for Future Generations**

Goal 1: Environmental resources shall be conserved for future generations by minimizing environmental impacts in all land use decisions.

Objective 1.1 Recognize that the degradation of one natural resource will have a concomitant negative effect upon the total resource base, including water, vegetation, air, wildlife, soil, and minerals.

Objective 1.2 Encourage only those uses and activities that are compatible with the fragile desert, aquatic, and marshland environment.

Objective 1.3 Coordinate the acquisition, designation, and management of important natural resource areas in Imperial County with other appropriate governmental agencies as necessary.

Objective 1.4 Develop standards to protect significant natural resource areas for the purpose of enhancing both the planning and decision-making process.

Objective 1.5 Provide for the most beneficial use of land based upon recognition of natural constraints.

Objective 1.6 Ensure the conservation, development and utilization of the County's natural resources.





Objective 1.7 Provide the opportunity for enjoyment of a quality natural experience to present and future generations.

Objective 1.8 Encourage the acquisition of scientific knowledge by encouraging the preservation of important ecological, archaeological, and other scientific sites.

### **Preservation of Biological Resources**

Goal 2: The County will preserve the integrity, function, productivity, and long-term viability of environmentally sensitive habitats, and plant and animal species.

Objective 2.1 Conserve wetlands, fresh water marshes, and riparian vegetation.

Objective 2.2 Protect significant fish, wildlife, plant species, and their habitats.

Objective 2.3 Protect unique, rare, and endangered plants and animals and their habitats.

Objective 2.4 Use the environmental impact report process to identify, conserve and enhance unique vegetation and wildlife resources.

Objective 2.5 Give wildlife conservation a high priority in County park acquisition and development programs.

Objective 2.6 Attempt to identify, reduce, and eliminate all forms of pollution which adversely impact vegetation and wildlife.

Objective 2.7 Discourage the use of wild native animals as pets.

Objective 2.8 Adopt noise standards which protect sensitive noise receptors from adverse impacts.

### **Preservation of Cultural Resources**

Goal 3: Important prehistoric and historic resources shall be preserved to advance scientific knowledge and maintain the traditional historic element of the Imperial Valley landscape.

Objective 3.1 Protect and preserve sites of archaeological, ecological, historical, and scientific value, and/or cultural significance.

### **Preservation of Agricultural Lands**

Goal 4: The County will actively conserve and maintain contiguous farmlands and prime soil areas to maintain economic vitality and the unique lifestyle of the Imperial Valley.

Objective 4.1 Encourage sound agricultural practices.



Objective 4.2 Control and prevent soil erosion when possible.

Objective 4.3 Support the efforts of the Imperial Valley Drainage Advisory Committee by encouraging the conformance to their criteria for the reclamation of salt affected land.

### **Preservation of Mineral Resources**

Goal 5: The County will identify and protect mineral resources for extraction and minimize the effect of mining on surrounding land uses and other environmental resources.

Objective 5.1 Encourage the sound extraction of mineral and quarry/aggregate resources while protecting the natural desert environment.

Objective 5.3 Require that mineral extraction and reclamation operations be performed in a way that is compatible with surrounding land uses and minimize adverse effects on the environment.

Objective 5.4 Safeguard the use and full development of all mineral deposits.

Objective 5.5 Regulate the development adjacent to or near all mineral deposits and geothermal operations due to the potential for land subsidence.

### **Conservation of Energy Sources**

Goal 6: The County shall seek to achieve maximum conservation practices and maximum development of renewable alternative sources of energy.

Objective 6.1 Define and assure adequate energy supplies for Imperial County.

Objective 6.2 Encourage the utilization of alternative passive and renewable energy resources.

Objective 6.3 Maximize energy conservation and efficiency of utilization

Objective 6.4 Minimize environmental impact of energy sources.

Objective 6.5 Minimize possibility of energy shortages and resulting hardships.

Objective 6.6 Encourage compatibility with National and State energy goals and city and community general plans.

Objective 6.7 Support local utility company's energy conservation programs.





## **Preservation of Visual Resources**

Goal 7: The aesthetic character of the region shall be protected and enhanced to provide a pleasing environment for residential, commercial, recreational, and tourist activity.

Objective 7.1 Encourage the preservation and enhancement of the natural beauty of the desert and mountain landscape.

## **Preservation of Water Resources**

Goals 8: The County will conserve, protect, and enhance the water resources in the planning area.

Objective 8.1 Protect all bodies of water, e.g. Salton Sea, and water courses for their continued use and development.

Objective 8.2 Maintain the salinity of the Salton Sea at 40,000 parts per million salinity and encourage the advantageous usage of the Salton Sea for agricultural and natural drainage, recreation, and development.

Objective 8.3 Regulate development in or adjacent to water bodies and courses, protect water bodies and minimize property damage. Zone the areas around the Salton Sea below elevation -220 feet as open space to minimize property damage from fluctuating sea elevations.

Objective 8.4 Ensure the use and protection of the rivers and other waterways in the County. Ensure proper drainage and provide accommodation for storm runoff from urban and other developed areas in manners compatible with requirements to provide necessary agricultural drainage.

Objective 8.5 Protect and improve water quality and quantity for all water bodies in Imperial County.

Objective 8.6 Eliminate potential surface and groundwater pollution through regulations as well as educational programs.

Objective 8.7 Reclaim polluted water bodies, such as the New and Alamo Rivers and the Salton Sea, if deemed necessary.

Objective 8.8 Ensure protection of water bodies that are important for recreational fishing.

Objective 8.9 Prohibit the inappropriate siting of solid or hazardous waste facilities next to water bodies or over sources of potable groundwater or recharge basins. In association with the clean up of the New River, all existing landfills in or near the river should eventually be closed.



Objective 8.10 Discourage the use of hazardous materials in areas of the County where significant water pollution could pose hazards to humans or biological resources.

Objective 8.11 Identify watersheds (recharge areas) and key areas for the protection of water quality and groundwater.

Objective 8.12 Protect aquifer recharge areas including specifying minimum parcel size.

Objective 8.13 Encourage water conservation and efficient water use among municipal and industrial water users, as well as reclamation and reuse of wastewater.

Objective 8.14 Coordinate with the appropriate agencies for the availability of water to meet future domestic, industrial/commercial and agricultural needs.

### **Protection of Air Quality**

Goal 9: The County shall actively seek to improve and maintain the quality of air in the region.

Objective 9.1 Ensure that all facilities shall comply with current federal and state requirements for attainment of air quality objectives.

Objective 9.2 Cooperate with all federal and state agencies in the effort to attain air quality objectives.

### **Preservation of Open Space**

Goal 10: Open space shall be maintained to protect the aesthetic character of the region, protect natural resources, provide recreational opportunities, and minimize hazards to human activity.

Objective 10.1 Confine future urbanization within adopted Sphere of Influence areas.

Objective 10.2 Recognize the regional significance of the development and conservation of recreational opportunities in Imperial County.

Objective 10.3 Provide a broad range of recreational facilities for all ages and economic groups emphasizing family-oriented opportunities.

Objective 10.4 Encourage the acquisition and development of additional County recreational facilities.

Objective 10.5 Any recreational activity must be developed in such a manner as to minimize any significant environmental impact on humans and existing natural resources.

Objective 10.6 Encourage the development and improvement of recreational facilities in Imperial County.



Objective 10.7 Coordinate federal, state, and local agencies for trail-oriented recreational uses.

Objective 10.8 Recognize that certain lands are unsuitable for high density development, and that prohibition and restriction of such uses are in the public interest, health, and safety.

Objective 10.9 Conserve desert lands, within the county's jurisdiction for wildlife protection, recreation, and aesthetic purposes.

### C. Relationship to Other Elements

The Conservation and Open Space Element Policy Matrix (Table 1) identifies the relationship between the Conservation and Open Space Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 1 CONSERVATION AND OPEN SPACE ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Geothermal	Water
Environmental Conservation	X							X
Biological Resources	X			X				
Cultural Resources	X							
Agricultural Preservation	X					X		
Mineral Resources	X						X	
Energy Conservation		X						
Visual Resources	X							
Water Use	X				X			X
Air Quality	X							
Open Space	X				X			





## **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

### **A. Preface**

The primary mechanism to implement the Goals and Objectives of the Conservation and Open Space Element is to incorporate environmental concerns into land use planning. This occurs primarily through the discretionary permit process of subdivision map review, rezones, conditional use permits, specific plans, and general plan amendments. Accompanying all of these applications is an environmental review process to identify significant site resources and evaluate project impacts.

In addition, the process of updating the County's resource data base needs to be a continual process of information exchange with County, State, and federal resource agencies. This includes the Bureau of Land Management, State Department of Fish and Game, U.S. Fish and Wildlife Service, Imperial Irrigation District, Soil Conservation Service, State Department of Conservation, Regional Water Quality Control Board, Air Pollution Control District, and many others.

### **B. Policies and Programs**

The following policies and programs describe activities which are intended to implement the Goals and Objectives that have been described in the previous section.

#### **1. Biological Resource Conservation**

##### **Policy**

Provide a framework for the preservation and enhancement of natural and created open space which provides wildlife habitat values.

##### **Programs**

- Identify Resource Areas (see Figure 3) to conserve and enhance native vegetation and wildlife. These areas shall include: BLM "Areas of Critical Environmental Concern (ACECs); areas of high value to wildlife; areas necessary for the protection and perpetuation of rare, endangered, and threatened species; and areas important for scientific study. Following identification of these areas, they shall be rezoned to limit development to low intensity uses which are compatible with resource conservation.
- Projects within or in the vicinity of a Resource Area, as defined in the Imperial County General Plan EIR, should be designed to minimize adverse impacts on the biological resources it was created to protect.
- Accept all donations of land which have high wildlife value. Where appropriate, Imperial County shall attempt to exchange donated lands of high wildlife value with other state, federal, or other resource agencies equipped to protect and manage such lands for other lands more appropriate to County needs.



- Preserve the native habitat of sensitive plants and animals through the dedication of open space easements, and by other means that will ensure their long-term protection and survival. Such easements shall preclude the erecting of any structures (temporary or permanent), placement of utilities, vegetation removal, or any other activities. These dedicated open space easements would also serve to reduce potential indirect impacts to sensitive biological resources that may result from human activities associated with future developments.
- Areas designated for biological open space preservation shall include buffers, which provide important breeding and foraging habitats for native and migratory birds and animals. Such buffers shall serve to separate future development from adjacent native habitat areas to ensure the perpetual regeneration of these habitats.
- Protect riparian habitat and other types of wetlands from loss or modification by dedicating open space easements with adequate buffer zones, and by other means to avoid impacts from adjacent land uses. Road crossings or other disturbances of riparian habitat should be minimized and only allowed when alternatives have been considered and determined infeasible.
- Rock outcrops which serve as significant boulder habitat for sensitive biological resources shall be included within open space easements.
- Preserve existing California fan palms in natural settings and other individual specimen trees which contribute to the community character and provide wildlife habitat.
- Preserve and encourage the open space designation of wildlife corridors which are essential to the long-term viability of wildlife populations.
- Integrate open space dedications in private developments with surrounding uses to maximize a functional open space/recreation and wildlife management system.

## **Policy**

Landscaping should be required in all developments to prevent erosion on graded sites and, if the area is contiguous with undisturbed wildlife habitat, the plan should include revegetation with native plant species.

## **Programs**

- Revegetation plans shall be submitted and approved by the Imperial County Planning Department and relevant resource agencies for the mitigation of sensitive habitat lost, and for disturbed areas created by roads or installation of facilities adjacent to native habitat. Such plans shall mitigate for the loss of sensitive habitat and habitat value based on a ratio consistent with accepted policy, as recommended by the State and federal resource agencies.

These specifications shall include, at a minimum, the following:





- Locations of ecologically appropriate planting areas.
- Site preparation/remedial grading.
- Amounts, sizes, and locations of appropriate overstory tree species to be planted.
- Hydroseed/container stock planting mixes and locations for appropriate understory shrub species and groundcovers.
- Timing of planting (for example, most plantings should be conducted during the rainy season).
- Protective measures during and after plant installation, such as temporary chainlink fencing to keep out construction equipment/personnel; caging to avoid potential herbivory (animal browsing); and permanent wood-rail fencing or signage to deter human intrusions. This would also reduce potential impacts caused by future active uses, or "edge effects", from adjacent residential areas.
- Irrigation schedule which specifies timing, frequency, length, and method of watering to ensure successful plant establishment. For example, temporary irrigation through the use of drip emitters should be installed around each tree to encourage deep tap rooting. Irrigation may only be necessary for the first one or two years, but could be extended throughout the monitoring period as determined necessary by the consulting biologist.
- The proposed habitat restoration sites shall be monitored for an appropriate period of time to ensure long-term plant survivorship. Monitoring shall be conducted by a qualified biologist proficient at horticultural and botanical sampling methods. The biological monitor shall be present at the time of plant installation to ensure correct implementation. The monitoring program shall clearly specify success criteria (e.g., percent vegetative cover for shrub species, percent canopy cover for tree species, etc.) to be evaluated by the biological monitor on a quarterly basis. Annual reports detailing the progress of the revegetation effort in attaining these goals shall be submitted to the Imperial County Planning Department and relevant resource agencies.
- A maintenance program shall be implemented for the length of the monitoring period. Primary goals of the maintenance program shall include staking, weed control and replacement of planted material that is diseased or has died. If the proposed restoration sites are not meeting stated goals of the Plan, supplemental remedial measures, such as additional weed control or replacement plantings, shall be recommended during the monitoring and maintenance period.
- When appropriate, a bond or other security shall be provided for all required revegetation plans, which would be released by the County only after: 1) the consulting biologist has concluded that all specified success criteria have been met;



and, 2) the County and other relevant permitting agencies have approved the successful completion of the plan.

- Clearing of shrubs, vines, and other native vegetation for purposes of fire control shall be coordinated with the local fire district, particularly in fire-prone areas. Where clearing is necessary, high-fuel plants shall be replaced with native, low-fuel plants. Where feasible or necessary for habitat protection, fire buffer clearing shall be done by hand so as to minimize disturbance to understory species. A list of important understory groundcover, shrubs, vines, ferns, and other vegetation shall be compiled by a qualified biologist, and included in all required landscape plans prior to final approval of individual projects.

## **2. Cultural Resources Conservation**

### **Policy**

Identify and document significant historic and prehistoric resources, and provide for the preservation of representative and worthy examples; and recognize the value of historic and prehistoric resources, and assess current and proposed land uses for impacts upon these resources.

### **Programs**

- The County will use the environmental impact report process to conserve cultural resources. Public awareness of cultural heritage will be stressed. All information and artifactual resources recovered in this process will be stored in an appropriate institution and made available for public exhibit and scientific review.
- Encourage the use of open space easements in the conservation of high value cultural resources.
- Consider measures which would provide incentives to report archeological discoveries immediately to the Imperial Valley College - Baker Museum.
- Coordinate with appropriate federal, state, and local agencies to provide adequate maps identifying cultural resource locations for use during development review. Newly discovered archeological resources shall be added to the "Sensitivity Map for Cultural Resources".
- Discourage vandalism of cultural resources and excavation by persons other than qualified archaeologists. The County shall study the feasibility of implementing policies and enacting ordinances toward the protection of cultural resources such as can be found in California Penal Code, Title 14, Point 1, Section 622-1/2.



### **3. Energy Conservation**

#### **Policy**

The County shall establish programs and procedures to encourage the conservation of energy by the general public.

#### **Programs**

- Promote the demonstration of new energy saving or supply technologies such as solar energy technologies on County facilities and the dissemination of information on their relative effectiveness and operating costs.
- Amend County Building Codes, in accordance with local conditions and State Energy Commission standards for both residential and nonresidential buildings, to include insulation requirements against heat infiltration in new construction.
- Encourage State legislation which would remove tax disincentives on capital investments in solar space cooling equipment.
- Amend County Building Codes to remove unnecessary obstacles to implementing energy conservation technology.

### **4. Mineral Resources Conservation**

#### **Policy**

Control the extraction of mineral resources in order to assure minimal disturbance to the environment, preservation of significant mineral deposits, and to protect mining operations from encroachment by incompatible land use.

#### **Programs**

- The County shall require all surface mine operators to submit surface mining and reclamation plans prior to beginning mining operations. Surface mining includes surface work incident to an underground mine. Such plans shall be processed by the Planning Department and shall require the approval of the Planning Commission. Following the approval of those plans and the commencement of surface mining operations, the Planning Department shall inspect each surface mining operation at least once a year, for the life of the operation to assure compliance with the mining plans.
- The County shall protect known mineral deposits and mining operations from the encroachment of incompatible urban land uses. All protected areas shall be reevaluated in light of future state reports identifying areas of regional and statewide mineral significance.





## 5. Open Space Conservation

### Policy

Identification of lands appropriate for open space conservation shall be included in the development review process. The application of regulatory controls must be non-confiscatory, non-arbitrary, and reasonable. It is not the intent of any of these measures to deny any landowners the reasonable use of his land, or be considered a "taking" under the law. The following are examples of various regulatory techniques:

### Programs

- The County Subdivision Ordinance may require the dedication of park land or the payment of a fee-in-lieu thereof. This device has not been utilized to date by the County. The developer should bear the costs for the increased pressure new subdivisions place upon existing facilities. Revenues realized by this device may be utilized for parks elsewhere in the County within a reasonable distance.
- Agricultural lands shall require a minimum parcel size of 40 acres for the preservation and protection of productive agricultural lands.
- A watercourse overlay zone should be included within the County Zoning Ordinance and applied where necessary to restrict or prohibit development in areas subject to flooding.
- Continue use of the "S" Open Space Zone for all unincorporated areas of the County not included in a precise zoning map.
- The Recreation and Public Purposes Act has been amended to include open space as a legitimate purpose. In the past, any land acquired had to be developed within a reasonable period of time. In 1973 the County was entitled to acquire 640 acres of Bureau of Land Management land per year at the cost of \$2.50 per acre. The County obtained 640 acres in the Hot Mineral Spa Area by this method.
- There are some lands in public ownership at the present time. The value and potential uses of these lands should be evaluated, and the possibility of exchanges for desirable open space or recreation lands explored.
- Acquisition of less than fee ownership can be accomplished with open space easements on privately owned lands for a term of not less than 20 years. Such lands must retain an open space character. Flooding easements had been utilized in the past in the Salton Sea area to limit damage caused by flooding. Also, the acquisition of a long-term lease can enable the County to preserve land for specified purposes. In the past, the County has leased the Truckhaven Archaeological Site pending State or Federal acquisition.
- The acquisition of development rights can also be used to permit the retention of the open character of certain land uses, notably agriculture. Incentive for owners to sell these rights



would result from a considerably lower tax assessment in view of the absence of development potential.

### **Policy**

The County shall participate in conducting detailed investigations into the significance, location, extent, and condition of natural resources in the County.

### **Programs**

- Encourage state and federal acquisition or management of areas or sites determined by the County and other agencies to possess important natural resource values, including small but significant landscape features and scientific sites.
- Participate in the process of site and area evaluation and analysis after an area is determined to possess natural resource value.
- Encourage acquisition of unique archaeological or scientific sites by State and Federal Agencies or non-profit organizations interested in preserving our cultural heritage.
- Allow only compatible land uses and consistent zoning adjacent to protected areas.
- Zone areas of natural resource value to preserve and protect their intrinsic values when applicable.
- Preserve unique sites and areas by controlling direct public access.
- Notify any agency responsible for protecting plant and wildlife before approving a project which would impact a rare, sensitive, or unique plant or wildlife habitat.

### **Policy**

The County shall discourage urban development on prime agricultural lands (Class II or III soils).

### **Programs**

- Recognize the incompatibility of small parcels to agricultural uses by adopting and enforcing large minimum acreage requirements in agricultural zones.
- Relate minimum acreage requirements in each zone to soil characteristics, climate, water availability, crop types, existing land use ownership patterns, and proximity to urban development.
- Encourage development of agriculturally related industries, such as packing and processing, on marginally productive lands.





- Consider creation of a fee or assessment on new development which converts land presently in agricultural use. The revenue would be used to purchase development rights or fee title to other land still in production or open space, as deemed necessary.

### **Policy**

The County shall recognize the economic importance of livestock production, as well as its incompatibility with urban uses, through zoning and development review programs.

### **Programs**

- Establish a plan and the required rezoning to prohibit feedlots in close proximity to residential or commercial uses. Conversely, these provisions should provide for the protection of feedlot operations from encroachment by residential and other incompatible urban uses.
- Establish adequate development and performance standards in the County Zoning Ordinance for animal husbandry, including dairies and feedlots, and appropriate animals per acre.

### **Policy**

The County shall take a pro-active role in working with local, state, and federal agencies to maintain and develop lands for outdoor recreation.

### **Programs**

- Encourage State and Federal Agencies to develop and operate recreational facilities which are determined by the County to possess more than local significance.
- Provide County input into state and federal recreation and wilderness areas so that the natural values of the area are preserved.
- Support controlled development of recreation facilities in primitive or wilderness areas so that the natural values of the area are preserved.
- Off-road vehicle (ORV) use is recognized as a popular recreational pursuit in the Imperial Valley. Areas which are not environmentally sensitive should be identified for this purpose.
- Encourage the recreational use of lands located in hazardous areas such as flood plains.
- Establish adequate development standards for private recreation facilities to assure the preservation of natural and scenic values.
- Implement subdivision regulations requiring developers to dedicate land for park or recreational use or pay a fee in-lieu thereof at the option of the County.



- Encourage the identification and designation of historic buildings, landmarks, and sites within the County.
- Encourage the acquisition of historic and cultural sites by public agencies or nonprofit organizations interested in their preservation.
- With the Imperial Irrigation District, explore the possibility of utilizing and improving certain portions of the canal system for picnic and fishing sites.
- Encourage the use of unobtrusive materials, structures, and color in power line transmission corridors. Vegetative screening is encouraged wherever possible.

### **Policy**

The County shall establish a program to identify open space necessary for the protection of public health and safety, such as floodplains, geologic risk areas, and airport flight zones, and maintain these areas in open space, agriculture, or other appropriate low intensity uses.

### **Programs**

- Floodway and floodplain boundaries shall be identified on County zoning maps when required studies have been completed.
- Structural development normally shall be prohibited in the designated floodways. Only structures which comply with specific development standards should be permitted in the floodplain.
- Limit use of floodplains to natural wildlife habitat, non-structural recreational use, and agricultural production.
- Some encroachment into floodplain areas may be permitted with proper hydrologic design, review by the Department of Public Works to assure that no public safety hazard is created, and a determination made that no significant impact to wildlife is created.
- Identify areas of known seismic activity and delineate on county zoning maps general areas in which development should be restricted.
- Control structural development upon or in the vicinity of an active fault.
- Require detailed engineering or soil studies on a case-by-case basis for development proposals located in an area characterized by soils of limited structural capabilities.
- Control development in areas of soil with properties which exhibit problems of erosion, limited bearing capacity, subsidence, shrink-swell, or slippage.



- Adopt General Plan designations and appropriate zoning to control residential uses in the aircraft flight zones and in areas which may be subjected to severe noise levels.
- Coordinate the review and consistency of projects near airports with the Airport Land Use Commission.

### **Policy**

The County will establish a policy to clean up the Salton Sea and the rivers of Imperial County, specifically the New River and the Alamo River, in order to promote water recreation activities.

### **Programs**

- The County of Imperial will work with Mexico to establish clean up procedures for the New and Alamo Rivers.
- Landfills located in or near the New River should eventually be closed as part of the New River clean up program.
- The County will evaluate and establish funding mechanisms and procedures to clean up the Salton Sea.





## APPENDIX A

### SURVEY OF MINERAL AND SOIL RESOURCES

#### A. Minerals

Significant opportunities, needs, and demands for minerals and raw materials exist in Imperial County's expanding economy. The more obvious needs are related to the inevitable construction demands. Additional sources of sand and gravel are needed even now. Utilization of limestone for cement from local sources will probably also become economically feasible. Gypsum, already mined, is likely to find expanding markets. Available sources of pumice and claystone for expanded lightweight aggregate lie ready for when the need arises.

Industrial materials such as kyanite, mineral fillers (clay, limestone, sericite, mica, tuff), salt, potash, and calcium chloride (geothermal sources) and sand (Algodones Sand Dunes) are readily available. Low cost power sources can provide added incentive for industrial development, enhancing the value of the County's mineral resources. Minerals extracted in Imperial County of highest economic value are gold, gypsum, sand, gravel, lime, clay and stone.

Gold and manganese deposits of the County contain sizeable reserves. Current trends in developing efficient mining techniques and processing methods have proven successful in exploration of gold deposits in the Glamis Plateau area and the Cargo Muchacho and Picacho Mountains.

Uncontrolled urbanization has basically the same effect on mineral resources as it does on agricultural lands. The geographic extent of mineral resources is a function of geologic factors, thus mining operations are restricted to the relatively few locations of mineral deposits suitable for extraction. Urban development removes these resources from available reserves, at least for the foreseeable future. This loss results not only from land uses situated atop potential extractive sites, but also from incompatible land uses on adjacent property. Extractive operations such as gypsum, sand, and gravel are particularly unwanted as neighbors by residential or commercial areas. Determination of the location, extent, and quality of mineral deposits is essential if they are to be protected from incompatible land uses.

The potential social and economic value of these resources is an important consideration when conflicting land uses are proposed. Mineral extraction provides employment, increased tax revenue, increased demand for local goods and services, and minerals or other materials at reasonable prices. These advantages must be weighed against the land requirements of other land uses and the possible impact upon the environment.

**Environmental Considerations.** The extraction industry may have significant impacts upon the natural environment. Damage has often been the result of failure on the part of local or state government to effectively regulate these uses. Without regulatory requirements, the industry is not required to take the necessary precautions.



Air quality is also of increasing concern to residents of Imperial Valley. The extensive areas of dust and sand create a high ambient dust level in the unirrigated portions of the County. Furthermore, agricultural burning also contributes significantly to reduced air quality. Open or surface mining may produce excessive amounts of dust which will require effective control measures to mitigate or prevent deterioration of air quality.

Extractive operations may also accentuate geologic hazards. The possibility of subsidence resulting from extraction of geothermal brine is discussed in the Geothermal and Transmission Element.

The possible effect of mineral extraction on surface and groundwater must also be considered. Mining operations must meet water quality standards established by the State Water Resources Control Board and the Regional Water Quality Control Board - Colorado River Basin Region 7. Regulations limiting discharge of mining waste materials generally prohibit pollution of ground or surface waters.

Recognition of public health and safety is important, particularly in view of the number of serious injuries resulting from abandoned mine shafts in the desert. If the mine is subsurface, the shaft should be sealed at the surface upon abandonment or completion of operations.

Mineral extraction, while often uncovering items of archaeological significance, frequently destroys the fragile setting and artifacts of the site. When considering applications for mining operations in areas of archaeological or other scientific interest, an on-site evaluation of the sites historical or archaeological value must be provided by the applicant and prepared by a qualified archaeologist.

Extractive industry in the local context may be highly visible, therefore aesthetic considerations are particularly important. While many of these operations are open, they should be shielded as much as possible from public view. Review of the probable impact of the extractive industry also requires that the potential noise impact on plants and wildlife be critically examined.

**Surface Mining and Reclamation Act of 1975.** Mining operations on federal, state and private lands are subject to the California Surface Mining and Reclamation Act (SMARA) of 1975. SMARA, enacted as Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board (under the California Department of Conservation, Division of Mines and Geology) adopt policies for the reclamation of mined lands. The law, to date, has been amended by Assembly Bill (AB) 1300-1980; AB 1110-1984; Senate Bill (SB) 593-1985; SB 1261-1986; and Assembly Bill 747-1987. The last amendment, in 1987, was also the most substantial policy change to SMARA.

SMARA is the state's answer to two seemingly contradictory demands - the need for a continuing supply of mineral resources and the assurance that significant adverse impacts of mining will be mitigated. The County Planning/Building Department as lead agency has the responsibility under SMARA, as amended, and State Policy for Surface Mining and Reclamation Practice, to regulate surface mining and reclamation within its jurisdiction including the reclamation of federal lands so as to assure that:

1. Adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adopted for alternative land uses.





2. The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.
3. Residual hazards to the public health and safety are eliminated (Public Resources Code Section 2712).

Under the Surface Mining and Reclamation Act of 1975, with specified exceptions, a person is prohibited from conducting surface mining operations unless a permit is obtained from, and a reclamation plan has been submitted to and approved by, the lead agency for the surface mining operation. A person who obtained a vested right to conduct surface mining operations prior to January 1, 1976, is not required to obtain a permit, but is required to submit a reclamation plan to the lead agency. The State Mining and Geology Board is required to review lead agency ordinances which establish permit and reclamation procedures.

In order to comply with SMARA, the County enacted Chapter 4.5, Surface Mining Operations into the Imperial County Ordinance (Sections 83450-83463). In addition, "Policies and Standards for Development and Reclamation of Natural Resource Areas", were adopted by the Board of Supervisors, on September 25, 1979.

AB 747 also clarified the definition of "lead agency" by specifying that cities and counties, and certain state agencies with land use regulatory authority, are lead agencies under SMARA. Pursuant to this, the County Board of Supervisors and the Bureau of Land Management (BLM), El Centro Resource Area have prepared and signed a Memorandum of Understanding (MOU) effective August 12, 1988. The MOU is an agreement to have the County process reclamation plans for mining operations located on federal lands for the BLM in order to avoid duplication efforts. The County and BLM have developed an effective and efficient permit system that meets the regulatory requirements without seriously disrupting development and operation of such projects.

In November of 1989, the State Office of Mines and Geology conducted a statewide survey to ascertain compliance with the requirements of SMARA. At that time it was found that there was substantial noncompliance by lead agencies. Of 116 mines analyzed only eleven percent were verified as being in compliance, and of the total reclaimed, thirty percent of the sites were determined to be unreclaimed or not reclaimed to SMARA standards. Additionally, the Bureau of Mines and Geology also determined that only a few agencies carried out site inspections and less than fifty percent of the lead agencies had notified the mining operations that were out of compliance.

As a result of the above survey, the Division of Mines and Geology informed the lead agencies that unless substantial compliance is immediate, it is their intent to pre-empt the SMARA program to the State Mines and Geology Board. There is legislation, AB 3551, which imposes substantially new and much more complex regulations on surface mining operations.

From the onset, Imperial County has pursued implementation and compliance with SMARA. Imperial was one of the few Counties found to be substantially in compliance with state requirements. Should SMARA be taken away from the local jurisdiction's control, compliance will become much more time consuming, with review and approvals required at the state level.



Additionally, the process would become more costly with substantially higher review fees and severe penalties for tardiness or noncompliance. In addition, local concerns and issues become unclear and statewide mandates become a burden to the local operations.

## 1. Gold

By far the greatest number of mineral deposits in Imperial County are those developed for the recovery of gold. Of approximately 220 mineral deposits listed by the California Division of Mines and Geology in the report *Geology and Mineral Resources of Imperial County, California*, 1977 by Paul K. Morton, about seventy five are gold mines or prospects.

Gold has been mined in Imperial County, with varying degrees of success since the late 1700's. In the above mentioned report, gold was ranked second to gypsum in total value of mineral production. Considerable development of gold has occurred since 1985, and gold now ranks as the mineral of highest economic value to the County.

Currently, three major mines are actively producing gold in Imperial County according to the U.S. Bureau of Mines. In 1988, Imperial County was the largest producer of gold in California, due primarily to the Mesquite Mine owned by Gold Fields Operating Company. Mesquite Mine and McGlaughlin Mine in Napa County compete closely as the largest producers in the State, and the two combined comprise about one third (1/3) to one half (1/2) of gold production in California. Recent figures from the U.S. Bureau of Mines in Washington indicate that Mesquite Mine, McGlaughlin Mine and Jamestown Mine in Tuolumne County account for approximately twenty-five percent of the United States gold production.

The most productive gold producing areas in the County are the Cargo Muchacho Mountains, the Picacho district, the Paymaster district, and the Potholes area. All of these areas lie within a 600 square mile region centered in the Southeastern corner of the County. The region embraces the Cargo Muchacho Mountains and the southeast half of the Chocolate Mountains. A few mines or prospects are known in the Northwestern Chocolate Mountains and in western Imperial County.

In 1985, the Bureau of Land Management, El Centro Resource Area, and the County approved the Plan of Operations and Conditional Use Permit for Gold Fields Operating Company's Mesquite Gold Mining and Processing Project. The mine is located approximately six miles east of the townsite of Glamis. Estimated reserves for this project are 56,000,000 tons with an average gold ore grade of 0.05 ounces per ton. There are 150,000 ounces of gold produced annually with a projected twenty year mine life.

In 1987, an expansion of the Mesquite project was approved, based on newly identified ore reserves, known as the VCR Project (Vista-Cherokee-Rainbow). These three new pits added 50,000,000 tons of ore with an average grade of 0.04 ounces per ton. This brought total gold annually produced by Gold Fields to 175,000 ounces. Both projects are immediately adjacent to each other, and when taken together represent the fifth largest deposit in the United States.

In 1987 another gold mine was approved about twenty-eight miles to the southeast in the Cargo Muchacho Range. This mine, the Padre/Madre, operated by American Girl Mining Corporation,





has a projected life of ten years, with gold ore reserves of 6,000,000 tons, and an average grade of 0.04 ounces per ton. Annual production is about 24,000 ounces.

Chemgold, Inc. a subsidiary of Glamis Gold, is successfully operating the Picacho Mine as an open pit leach operation. About 24,000 ounces of gold per year is produced from patented mining claims. This project was approved in 1987 by the Imperial County Board of Supervisors, and was the original mine that proved the feasibility (both from an engineering and economic standpoint) of the low grade disseminated deposits characteristic of Imperial County.

In early 1988, in the Picacho Peak area, a test 50,000 ton heap leach facility was being operated by a Canadian company, Christie Gold, Limited, to determine the metallurgical characteristics of a relatively small, low grade (approximately 0.03 ounces of gold per ton) deposit that has been identified between the Colorado River and Picacho Mine.

In late 1988, a second mine operated by American Girl Mining Company, in a canyon east of the Padre/Madre mine was approved. This mine, known as the American Girl Canyon Project is both a heap leach open pit as well as an underground mine with conventional milling facilities. The open pit portion of the project has reserves of 5,500,000 tons with an average ore grade of 0.05 ounces per ton. The underground portion has reserves of 1,500,000 tons with an average grade of 0.20 ounces per ton. This new project will have a life of eleven years and will boost American Girl Mining Company's gold production from the combined projects to 60,000 ounces per year.

Farther north from the Cargo Muchacho Mountains, six miles east of Ogilby Road, along Indian Pass Road, Imperial Gold is developing the Indian Rose Deposit. This will also be a large scale open pit gold mine with minimum reserves noted at 16,000,000 tons. Permitting for this project is expected to begin in the fall of 1992.

In 1989, Homestake Mining and later on Newmont Exploration (1990) applied for permits to conduct exploratory drilling in the northwestern portion of the County near the Torrez-Martinez Indian Reservation. In 1989, Battle Mountain Exploration Company conducted exploratory drilling in the Imperial Gables area north of the junction of Highway 78 and Ogilby Road. Imperial Mining (Paragon) applied to do similar work in the same general vicinity, but their project has been delayed due to the recent listing of the desert tortoise as an endangered species by the U.S. Fish and Wildlife Service. Imperial Gold is currently in the permitting process to do extensive exploratory work along Indian Pass Road north of the Cargo Muchacho Mountains. In 1991, American Girl Mining obtained permits to conduct a drilling program in the area immediately east of the American Girl Canyon Project.

Chemgold is presently preparing the required environmental documentation for the expansion of its Picacho mining operation.

## **2. Gypsum**

The Fish Creek Mountains gypsum deposit constitutes the largest reserves of this commodity in California. More than 31.2 million tons of gypsum has been mined from this deposit. Of that, 30.1 million tons have been extracted by U.S. Gypsum Co. since 1945. Since 1984, an average of one





million tons of gypsum is produced by U.S. Gypsum Company's Plaster City Plant each year. This is the sole active gypsum mine in the County, and the largest gypsum mine in the United States. Seven counties in the State of California produce crude gypsum. In 1987, 1,924,074 short tons of crude gypsum were produced statewide, being valued at approximately \$39 million dollars (U.S. Bureau of Mines). The Plaster City Quarry accounts for fifty-two percent of that, and the expected life of the deposit at current production rate is just over 100 years. Gypsum mined in the County is used to manufacture both raw and calcined gypsum products. Raw gypsum products are portland cement rock which is crushed, sized gypsum used to retard set in cement, and agricultural gypsum which is used as a soil amendment.

Other raw gypsum products are more specialty products such as fillers for a variety of industries and a feed grade sold for agricultural use. Calcined gypsum products or stuccos are used to produce a full line of plaster products including casting, molding, flooring, and base and finish coat wall plasters. Some of these plaster products require a high purity (93%) and high whiteness (72% versus Titanium Oxide Standard) rock which amounts to about ten percent of the total rock produced. The remainder of all other products require rock purities in excess of eighty-eight percent but typically all products average ninety-four purity which is the average field purity of the deposit. The majority of stucco usage (80%) is for wall board manufacture both at the Plaster City Plant and Santa Fe Springs, a satellite plant in the Los Angeles area. The Plaster City board lines produce a full line of board products including regular half (1/2) inch and five eighths (5/8) inch wall boards and specialty wall boards, such as fire rated board, water resistant panels, shaft wall liners, mobile home board, vinyl covered board, rock lath, plaster base board, and exterior sheathing.

As Southern California continues to grow, Plaster City continues to be strategically located to serve the market. As a resource area, no other suitable gypsum deposit of sufficient size and purity for wall board and plaster manufacture exists on the West Coast. Gypsum must be imported from Baja California, Mexico, or finished products transported in from Nevada, Arizona, Utah, or New Mexico.

Even though the vast gypsum deposits of Imperial County were known to exist many years prior to 1922, no successful attempt to mine the deposits was made until after the construction of the San Diego and Arizona Eastern Railroad in 1920. A narrow gauge railroad connecting the deposit with the main line was completed in October 1922 by the Imperial Gypsum and Oil Corporation. Only crude gypsum was shipped until the properties were acquired by Pacific Portland Cement Company, which completed a 300 tons per day calcining plant in late 1924. This company mined the deposit until July 1945 when the operation was sold to the United States Gypsum Company. The United States Gypsum Company expanded and modernized the plant facilities at Plaster City and has since maintained a steady output. Access to the Fish Creek Mountains gypsum deposits is via a paved road, ten miles south of Ocotillo Wells on State Highway 78, twenty-two miles west from the junction with State Highway 86. Also, a narrow gauge railroad, owned by United States Gypsum Company, runs from the company's quarry at the deposit to their calcining and wallboard plant at Plaster City, twenty-five miles to the south.

The Fish Creek Mountains gypsum deposits are remnants of a formerly thick bed that probably covered a much larger area than is presently exposed. The largest and thickest remnants are in the northwest half of the property owned by the United States Gypsum Company. To the southeast, on



United States Gypsum's property, erosion has separated the gypsum into detached bodies. The gypsum on the northeast side of the wash dips beneath the alluvium and reappears on the other side. This body is controlled by California Portland Cement Company. Another large remnant lies above the cliff near the County boundary on the southwest limb of the previously mentioned anticline and is owned by National Gypsum Company. A 100 foot thick remnant, known to contain celestite (a form of gypsum), occurs just north of Fish Creek Wash on land which is now on state park property.

Other lesser deposits of gypsum are known to occur in the Coyote Mountains to the south. Most of the beds, which occur interbedded with claystone in the Imperial formation, are only a few feet thick.

### **3. Sand and Gravel**

1988 records with the U.S. Bureau of Mines reflect eight construction quality sand and gravel operations run by four operators: Desert Gravel Co., Aggregate Products, Imperial County Road Department and Tar-Mac Roadstone U.S.A., Inc. In 1988, production equaled 753,884 short tons, valued at \$2,604,613. Construction materials such as sand and gravel are high bulk, relatively low value resources. As the distance between the point of extraction and potential utilization increases, the cost increases significantly. Suitable sand and gravel deposits may exist in only a limited number of sites within the County; extraction will logically locate at those locations. If these areas are not designated as resource areas and incompatible uses are permitted, they are essentially lost.

Imperial County does not possess any deposits classified as "good", however, "fair" sources of gravel are found in the Yuha area, along the ancient beachline, and in alluvial fans at the base of the eastern mountains. The basis of the value depends on gradation, quality, accessibility, or depth to the water table and must be examined on-site on an individual basis. Adequate quantities of usable sand are available along the ancient beachline. The dune sands are less suitable for concrete because its spherical shape restricts hardening. While not of exceptional quality or suitability, available sand and gravel resources could be utilized to meet local demands.

### **B. Soils**

Most of the information contained in this section summarizes information existing in the Soil Survey of Imperial County California, Imperial Valley Area, prepared by the United States Department of Agricultural, Soil Conservation Service (SCS), in cooperation with University of California Agricultural Station and the Imperial Irrigation District (October 1981). Major field work for the survey was conducted during 1962-1975.

The soil survey contains information useful in land use planning, particularly predictions of soil suitability for selected land uses. Also addressed in the survey are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank





leach fields. A high water table makes a soil poorly suited to basements or underground installations. These soil properties, in addition to others are described in the SCS Soil Survey.

The soils of Imperial Valley consist of silty clays, silty clay loams, and clay loams that have formed on nearly level old lakebeds and floodplain deposits. The soils are generally deep, highly calcareous, and usually contain gypsum and soluble salts. The central irrigated area served by the District generally has fine textured silts. Sandy soils predominate in higher areas, such as the East and West Mesas, and are typical of most of the deserts in the Southwest United States. These soils do not have well defined horizons and are several thousand feet deep.

The SCS Soil Survey identified ten major soil associations comprising the following two groups based on landscape:

- (1) Well drained to poorly drained soils, dominantly in the lacustrine basin.
- (2) Well drained and somewhat excessively well-drained soils, dominantly on the East Mesa and the West Mesa.

A general soil map contained in the SCS Soil Survey depicts the soil associations in the survey area. This soil map gives a broad perspective of the soils and landscapes to provide a basis for comparing large areas for general land use; it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. There are six major soil associations that predominate in the lacustrine basin portion of the Valley and four major soil associations that are dominantly on the East Mesa and on the West Mesa.

Soils found in the lacustrine basin are nearly level and are moderately well drained to well drained, except for soils adjacent to the Salton Sea, which are poorly drained. Soils in the basin area are mainly used for crop production through irrigation and constitute over sixty percent of Imperial County.

Extensive irrigation and seepage from canals over the years has given rise to a perched water table present in most soils in the lacustrine basin of Imperial County. There are also low lying areas around the Salton Sea with observed high salinity that are not used for agriculture.

Dominant soils on the East and West Mesas are nearly level to moderately steep. These well drained soils are generally used for desert recreation or as desert wildlife habitats and are not productive for agriculture, except for a few areas of Rositas soils.

The more specific location of each kind of soil (45 varieties) is shown on detailed soil maps in the SCS Soil Survey. The various kinds of soil in the survey area are described, and information is included about each soil for specific uses.

For additional information, or a copy of the soil survey, contact the local Soil Conservation Service or the U.C. Cooperative Extension Service. A copy is also on file in the Imperial County Planning Department for review.



## 1. Soil Description

Agriculture in the Valley is practiced primarily in the lacustrine basin of Imperial County, which was formerly occupied by Lake Cahuilla. A few isolated areas in the basin are used for urban and agro-industrial development, water impoundment, desert wildlife habitat, and recreational purposes. Soils located on the East and West Mesas surrounding the lacustrine basin are mainly used for desert recreation or as desert wildlife habitats with a few isolated areas of intensive agriculture.

The 1981 SCS Soil Survey of Imperial County groups the soils found in the lacustrine basin into the six soil associations for broad interpretive purposes described below, making up sixty-six percent of the survey area:

### a. Well Drained to Poorly Drained Soils Dominantly in the Lacustrine Basin

#### Imperial

Nearly level, less than two percent slope, and moderately well drained silty clays. These very deep calcareous soils formed in alluvial deposits constitute approximately thirteen percent of the survey area; Eighty-five percent of the soils in this association are Imperial soils used for the production of field crops and homesites. The natural drainage of these soils and other soils in the basin has been altered by seepage of irrigation water from canals and through extensive irrigation. Tile drains are necessary to maintain the water table below the root zone.

#### Imperial-Holtville-Glenbar

Soils in this association are nearly level with slopes of less than two percent and moderately well drained to well drained silty clays, silty clay loams, and clay loams. This group is comprised of forty percent Imperial soils, twenty percent Holtville soils, and twenty percent Glenbar soils. As with most soils in the lacustrine basin, problems associated with perched water exist in this group. Soils in this group are mainly used for the production of field and vegetable crops with a few areas used for homesites.

The Imperial and Imperial-Holtville-Glenbar soils are limited for the construction of homes mainly by the shrink-swell potential, low strength, and wetness. Septic tank absorption fields are limited by the perched water table and slow permeability. Foundations and septic tank absorption fields need to be specially designed.

#### Meloland-Vint-Indio

With slopes of less than two percent, these soils make up about sixteen percent of the survey area. This group is comprised of thirty percent Meloland soils having a sandy loam surface layer and silty clay subsurface below two feet, twenty five percent Vint soils consisting of a fine sandy loam surface layer and loamy very fine sand underlying the surface, and twenty percent Indio soils of very fine sandy loam. Roughly two-thirds of these well-drained soils are located in the lacustrine basin and the remaining are located on low fans of West Mesa. Soils in this association, where irrigated water is available, are mainly used for field or vegetable crops with a limited amount of citrus production.





Soils located on the West Mesa are used for desert recreation or wildlife habitats, due to the lack of water available for irrigation.

### **Niland-Imperial**

Soils in this association have slopes in the range of zero to two percent and are moderately well drained, although natural drainage has been altered in extensively irrigated areas. A significant portion of these soils are located in the northeastern area near the town of Niland. This soil group constitutes only four percent of Imperial County and is comprised of two-thirds Niland soil and about one-fourth Imperial soil. A few areas in the soil group are used for field or vegetable crops. Desert recreation and wildlife habitats are the major uses of the land, although most of the land is left idle.

### **Glenbar-Imperial**

Soils included in this association make up only two percent of the soils in Imperial County dominantly in basins on West Mesa. These soils are nearly level with zero to two percent slopes and moderately well drained to well drained silt loams, clay loam, silty clay loam, sand, fine sand, and silty clay. Glenbar clay loam soils comprise about sixty percent of this soil association while Imperial soils represent about twenty-five percent. Most of the areas associated with this soil are barren or support scattered salt-tolerant ephemerals. Land uses consist of desert recreation and wildlife habitats.

### **Fluvaquents**

This group of strongly saline soils formed in alluvium are located along the edge of the Salton Sea. These soils have slopes of less than one percent and are poorly drained. Fluvaquent soils exhibit stratified layers ranging from silty clay to fine sand. Depth to water table occurs three feet below the surface of these soils, which constitute less than one percent of all soils in the Imperial County; ninety-five percent of this soil group consists of fluvaquents, with the remaining portion somewhat excessively well drained Rositas soils on dunes. Land in this soil is not conducive to agriculture because the soil lacks drainage outlets and is subject to flooding when the Salton Sea rises.

### **b. Well Drained and Somewhat Excessively Drained Soils Dominantly on East Mesa and on West Mesa**

Soils on the East and West Mesas are identified in the SCS Soil Survey of Imperial County according to four soil associations, and make up about thirty-four percent of the survey area:

### **Rositas**

These soils make up about twenty percent of the survey area, with slopes ranging from zero to thirty percent. The soils are somewhat excessively drained sand, fine sand, and silt loam. The plant cover includes shrubs of creosote-bush, ephedra, white bursage, wingscale, and desert buckwheat, with big galleta grass and numerous ephemerals. Areas of this unit are mainly used for desert recreation and as desert wildlife habitat. Some parts are sources of sand and gravel. A few areas of Rositas soils are used for field or vegetable crops and citrus.





### **Rositas-Superstition**

Found on East Mesa, this map unit makes up about eleven percent of the survey area. It is about sixty-eight percent Rositas, twelve percent Superstition soils, and twenty percent minor soils. Slopes are zero to two percent, somewhat excessively drained loamy fine sand or fine sand. Natural vegetation is a space cover of creosote-bush, ephedra, white bursage and wingscale. Areas of this unit are mainly used for desert recreation and as desert wildlife habitat.

### **Antho-Superstition-Rositas**

This unit makes up about two percent of the survey area, most areas are on West Mesa. Slopes are nearly level, consisting of zero to two percent. The soils are well drained and somewhat excessively drained fine sand and loamy fine sand. The natural vegetation is creosote-bush and desert ephemerals. Areas are used for desert recreation, as desert wildlife habitat, and as military test ranges.

### **Holtville-Antho**

Found predominantly on East Mesa, soils are nearly level, well drained loamy fine sand, loam, silty clay loam, and silty clay. The sparse natural vegetation is creosote-bush and desert ephemerals. This unit makes up about one percent of the survey area, being about forty percent Holtville soils, twenty percent Antho soils, and forty percent minor soils. Areas of this unit are used for desert recreation, as desert wildlife habitat and as military ordinance ranges. A few places are sources of clay for road base and canal lining.

Soils that exhibit a profile that is similar constitute a soils series. Soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile but may differ in texture of the surface layer of the underlying substratum. These differences in a particular soil series result in division of the series into phases. A summary of all soil phases in a soil series, including miscellaneous soil types identified in Imperial County can be found in the soil survey. Based on information contained in the soil survey, it is apparent that the following soil series predominate in the agriculturally developed areas of the valley:

<u>Soil Series</u>	<u>Total Area Acres</u>
Imperial	Over 210,000
Glenbar	Approximately 95,000
Holtville	Over 80,000
Vint	Over 60,000
Meloland	Approximately 60,000
Indio	Approximately 40,000

Rositas and Superstition soil series predominate on the East and West Mesas with over 280,000 acres and approximately 19,000 acres, respectively.



## **2. Soil Characteristics**

SCS has classified soils in the Imperial Valley into capability classes, subclasses, and units showing the general suitability and limitation factors of soils for most kinds of field crops. Soils are classified according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. Capability classification does not take into account major land reforming, reclamation, or management of the land. The SCS groups the capability classes into the following categories: Classes I-IV are suitable for agriculture if irrigated, Classes V-VI are marginal, and Classes VII-VIII are unsuitable for agriculture. Based on these classifications, most of the acreage in Imperial County appears to be suitable for agriculture if irrigated.

A brief discussion of the potential for producing general field and vegetable crops on each soil type is presented in the SCS soil survey.

## **3. Salt Buildup in Soils**

The relatively high level of dissolved salt in irrigation waters and the clayey nature of soils in most parts of Imperial Valley combine to produce ideal conditions for salt buildup in the soil. Crops vary in their sensitivity to salinity, but all of these suffer a loss in yield ranging from a few percentage points to total crop failure, depending on the severity of salt buildup. This phenomenon is well recognized by growers in this area. To combat salt buildup, they must either:

- (1) Apply additional irrigation water beyond consumptive use requirement.
- (2) Leach accumulated salts periodically through flooding of the affected plots of land for an extended time period.

Without these remedial actions, land becomes economically unproductive after a few seasons of normal crop production under irrigation. Provision for the leaching requirement in the application of irrigation water is routine in most areas; however, the extent of the requirement is a function of the salt content of the applied water and the degree to which salt concentration has already taken place in the soil. Thus, a reduced salinity level in the applied water could reduce the present leaching requirement. These water savings would be accompanied by a steady reduction in the soil salt content over the years, which, in turn, would also result in increased crop yields and would enable the farmer to change to more intensive, higher valued crops.

It has been estimated that about one-quarter of the irrigable lands were adversely affected by salt and high water tables in 1919. In 1940, an Imperial Valley Drainage Advisory Committee was formed. The Committee supervised a ten year investigation of drainage methods by technicians of the Soil Conservation Service and the Imperial Irrigation District (IID). Satisfactory criteria for drainage and reclamation of salt affected land in the area were developed. Currently, approximately 31,552 miles of tile drains underlie 438,893 acres of land within the Imperial Irrigation District boundaries.





#### 4. Limitations on Land Use

Soil characteristics must be evaluated with particular land use in mind. For example, allowable soil pressure has little effect upon irrigated agriculture; however, it would be of primary importance where a high rise structure is contemplated.

Steep or excessively flat land does not preclude development, however construction in these areas generally entails greater investment. Total investment includes not only the cost of the structures but also site preparation, site development, utility services, and provision of drainage facilities and access roads. This investment in physical construction in certain areas is not the sole factor in determining the feasibility of developments, however it may be a significant consideration. Few steep slopes which would present potential difficulties are found in the urban areas of the County. However, excessively level lands may pose problems, as a slope of less than one percent drains poorly; this difficulty may be compounded by the run off characteristics of particular soil types. Most of the urban areas are located on exceedingly level terrain. While annual precipitation is minimal, it is often very intense. The level terrain, soils of low permeability, and large quantities of rainfall over a short period result in flooding in some areas, a notable example is the Winterhaven area. Additionally, the Ocotillo area has numerous major and minor washes which may present serious hazards if development is permitted in their path. Development in these areas must devote particular attention to these physical limitations.

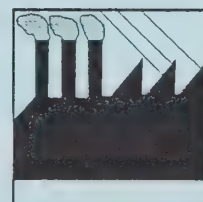
Soil characteristics may create conditions which endanger structures or inhabitants. Two primary areas of concern are susceptibility to shrink swell and limitations on allowable soil pressure. Soils which exhibit these two limitations are considered unstable. The location and extent of unstable and unsuitable soils and geologic hazard areas is discussed in the Seismic and Public Safety Element.

Desert soils form a shallow, fragile crust or "pavement" which serves to reduce wind erosion. When this poorly developed layer is disturbed, such as by off-road vehicles, susceptibility to wind erosion is greatly increased. While significant amounts of dust or sand are not normally moved for great distances, removal of soil may continue until the next substantial rainfall re-establishes the crust.

The management of soils is important for controlling erosion, increasing soil productivity, assisting in watershed management and flood control, and aiding in the rehabilitation of eroded or damaged areas.

Soil characteristics do not dictate the type of development that a particular site may accommodate, however, it does have a significant influence. The costs of overcoming severe soil limitations may make the site economically unfeasible for certain land uses. As development pressure intensifies, the engineering and design necessary to overcome these limitations may be economically justified.





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geothermal and transmission element

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## **IMPERIAL COUNTY GENERAL PLAN GEOTHERMAL AND TRANSMISSION ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

Imperial County contains one of the potentially largest geothermal liquid-dominated resources in the world. The geothermal resources in the County are the hottest and located at relatively shallow depths. The liquid-dominated geothermal resource can provide a relatively clean source of power as compared to other energy sources (e.g., coal and petroleum reserves) which have resulted in significant impacts to the environment and society.

Imperial County is a national leader in the development of its geothermal resources. Due to a variety of factors, however, the development of geothermal resources has not progressed as rapidly as projected in previous County Geothermal and Transmission Plans (1977, 1985, and 1990). These factors that can limit development include high operating costs, slow growth in utility company demand, and relatively low costs for oil. The County supports and encourages the development of geothermal resources in a manner compatible with the protection of agricultural and environmental resources. The County implements this goal by providing leadership, staff liaison with other regulatory and permitting agencies, and an effective set of plans and standards to facilitate the development process.

The Geothermal and Transmission Element is composed of four chapters:

Chapter I describes the nature of the Geothermal and Transmission Element, its relationship to the General Plan as authorized by the California Government Code, and benefits of geothermal development.

Chapter II examines current and future conditions for the development of geothermal resources, including the unique geologic conditions in Imperial Valley, type of geothermal resources, and existing geothermal developments.

Chapter III presents the goals and objectives of the Geothermal and Transmission Element.

Chapter IV identifies implementation programs and plans.

#### **B. Purpose of the Geothermal and Transmission Element**

The Geothermal and Transmission Element is an optional element of the Imperial County General Plan as permitted by Section 65303 of the California Government Code.

The purpose of the Geothermal and Transmission Element is to provide a comprehensive document that contains the latest knowledge about the resource, workable development technology, legal





requirements, policy (County, State, and federal), and implementation measures. The Element provides a framework for the review and approval of geothermal projects in the County. The development projections in this Element are based on forecasts obtained from the geothermal industry, regional utilities, and County staff. It is not the intent of the Geothermal and Transmission Element to provide zoning, regulation, or taxation.

### **C. Benefits of Geothermal Development**

The benefits of geothermal development in Imperial County are:

1. Fiscal benefit of expanded property tax revenues.
2. Fiscal benefit of sales tax revenues from purchase of goods and services.
3. Royalty and lease benefits to local landowners and County.
4. Social and fiscal benefits from increased economic activity and employment opportunities.
5. Improvements in technology to reduce costs of electrical generation.
6. Air quality improvement by displacement of fossil-fueled general electricity with geothermal power which does not add to the greenhouse effect.

A detailed discussion of these benefits is located in Appendix E.



## II. EXISTING CONDITIONS AND TRENDS

### A. Preface

According to the State of California Public Resources Code, Chapter 1398, Section 6903, geothermal resources are defined as:

The natural heat of the earth, the energy in whatever form, below the surface of the earth present in, resulting from, or created by, or which may be extracted from such products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth but excluding oil, hydrocarbon gas, or other hydrocarbon substances.

### B. History of Geothermal Use

California geothermal resources in the form of hot springs were initially used by Native American Indians and later European settlers. The first attempts to utilize the underground resources in the County commenced with the drilling of three wells between 1927 and 1928. The wells were abandoned because the steam pressure and volume were insufficient for commercial use. Carbon dioxide escaped from these wells and subsequent wells were drilled between 1932 and 1954 to collect the gas for commercial purposes. Successful geothermal wells were drilled in the 1950s but the production of electricity was impeded by mineral deposition and corrosion of equipment. An expanded account of the history of the use of geothermal resources is located in Appendix A.

From 1965 to 1970, the University of California at Riverside conducted an intensive investigation of the Imperial Valley. The research culminated in a 1971 report entitled, *Cooperative Geological-Geophysical-Geochemical Investigations of Geothermal Resources in the Imperial Valley Area of California*.

Numerous subsequent studies throughout the years have been performed to determine the nature of geothermal resources in the Salton Trough including studies of temperatures and temperature gradients; ground levels and slopes; seismicity; isotopic studies of groundwater and hydrology of underlying waters; gravity anomalies; magnetic anomalies; and stratigraphic geology. This data has facilitated the development of economically efficient geothermal power plants.

### C. Geologic Conditions

Imperial County is situated in the Salton Trough, a 3100-square mile structural depression that extends from the Transverse Range on the north to the Gulf of California on the south. The Peninsular Range forms the western border and the Colorado River forms the eastern border. The formation of the Colorado River delta perpendicular to the Trough created a closed basin to the north that contains the Salton Sea and Imperial Valley. The Salton Trough is an active spreading rift valley where sedimentation and natural tectonic subsidence are nearly in equilibrium. A thick clay-dominated strata extends downward from 1,000 to about 3,000 feet throughout the Trough.



The California Division of Mines and Geology recognizes the Salton Trough as an area underlain at shallow depths by thermal water of sufficient temperature for direct heat application. Separate anomalies are distributed throughout the Trough and have hotter fluids that are suitable for electrical generation. The percentage of dissolved salts in the hot water is extremely high which has resulted in the saline corrosion of equipment from use of this brine. Large scale development of the geothermal resources has depended on the ability to engineer cost-effective technology which overcomes technical problems and makes geothermal development economically feasible.

The United States Geological Survey (USGS) has designated nine Known Geothermal Resource Areas (KGRAs) in Imperial County. A KGRA is defined as:

An area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary of the Interior, engender a belief in those who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose (30 U.S.C. 1001).

The nine KGRAs are located throughout the county and they vary in temperature, pressure, and chemical composition of brine solutions found in each area. Figure 1 details the KGRAs, the Geothermal Overlay Zones, and location of existing and proposed power plants. The nine KGRAs which have been designated in Imperial County are Salton Sea, Westmorland, North Brawley, South Brawley, East Brawley, Heber, East Mesa, Dunes, and Glamis.

These KGRA's total 347,941 acres in the County of Imperial, or almost 12 percent of the total County land area. Figure 2 illustrates the distribution of the State's KGRAs, including the KGRAs in Imperial County.

#### **D. Type of Resource and Temperatures**

The rate of fluid flow required for the production of electrical energy is dependent upon the temperature of the brine. A lower flow rate is required to produce electricity when the brine is at a higher temperature. Table 1 provides information about temperature, existing well depths, and total dissolved solids for each of the KGRAs. Temperatures range from a low of 250° F in the Glamis and Dunes KGRAs to over 600° F in the Salton Sea KGRA.

In Imperial County, the total heat in storage is estimated to be  $20 \times 10^{19}$  joules ( $90 \times 10^{16}$  BTUs). Fifteen percent of the heat is in a fluid state and 85 percent of it is in the rock. There are an estimated 250 million acre-feet of recoverable fluids with temperatures greater than 302° F. Approximately  $3.14 \times 10^{14}$  joules are required to produce one megawatt of electricity for a year. The injection and recycling of fluids enhances the recovery of heat stored in the rock and the earth's core naturally heats the geothermal reserves at the rate of  $5 \times 10^{16}$  joules per year. Geothermal resources, like fossil fuels, may be used up faster than they are replaced and are considered a nonrenewable resource.





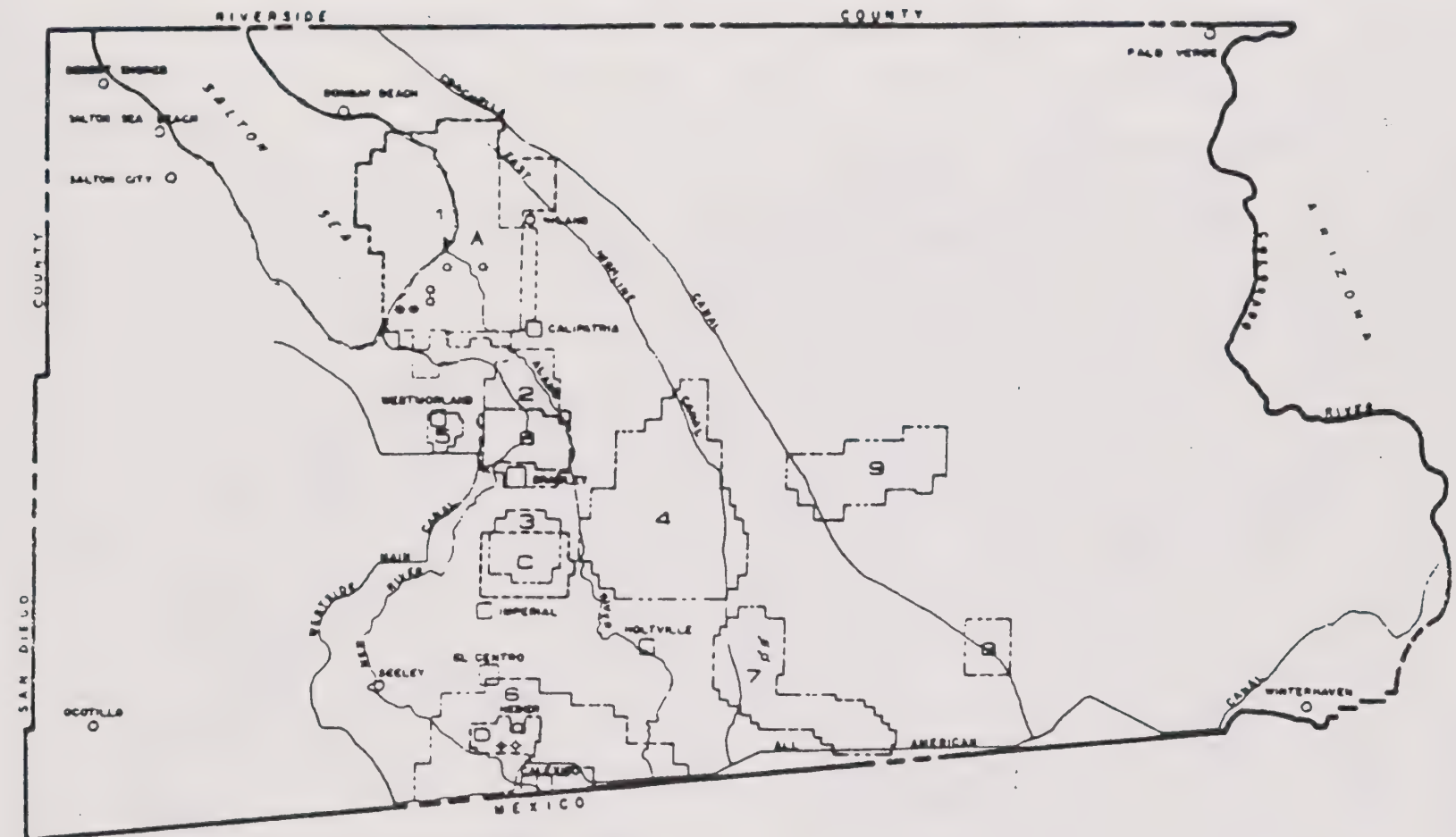
**TABLE 1  
GEOTHERMAL RESOURCE OVERVIEW**

Name of KGRA <sup>1</sup>	Acreage		Production Permits				Typical Resource		
	KGRA	"G" Zone	Estimated Megawatts	Permitted	Under Construction	On-Line	Depth	TDS	Temp. (F)
Salton Sea	102,887	111,444	1,400 MW	243	----	243 MW	4,000'	250,000	600
North Brawley	28,885	14,000	100 MW	----	----	----	7,000'	150,000	525
South Brawley	12,640	15,000	100 MW	49	----	----	13,500'	250,000	500
East Brawley	70,211	----	----	----	----	----	12,000'	150,000	400
Heber	58,568	7,000	200 MW	33	----	47 MW	6,000'	14,000	360
East Mesa	38,365	----	150 MW	----	----	121 MW	6,000'	7,500	350
Westmorland	3,200	----	----	----	----	----	7,000'	26,000	325
Glamis	25,505	----	----	----	----	----	5,000'	----	250
Dunes	7,680	----	----	----	----	----	4,000'	----	250
<b>Total</b>	<b>347,941</b>	<b>147,444</b>							

<sup>1</sup> The California Division of Oil and Gas has designated five geothermal fields in Imperial County: Brawley, Heber, East Mesa, Mesquite, and Salton Sea.

Key: "G" Zone - Geothermal Overlay Zone  
 KGRA - Known Geothermal Resource Area  
 MW - Megawatts  
 TDS - Total Dissolved Solids





#### KGRA's PLANNING SCENARIO

1. Salton Sea	1400 MW's
2. North Brawley	100 MW's
3. South Brawley	100 MW's
4. East Brawley	--
5. Westmorland	--
6. Heber	200 MW's
7. East Mesa	150 MW's
8. Dunes	--
9. Glamis	--

#### COUNTY GEOTHERMAL "Q" ZONES

A	Salton Sea
B	North Brawley
C	South Brawley
D	Heber

- Cities
- Townships
- KGRA's (Known Geothermal Resources Area's)
- Geothermal Zones



Imperial County  
General Plan

Imperial County Geothermal Resources

Geothermal and Transmission Element

Figure  
1





## OFFICES

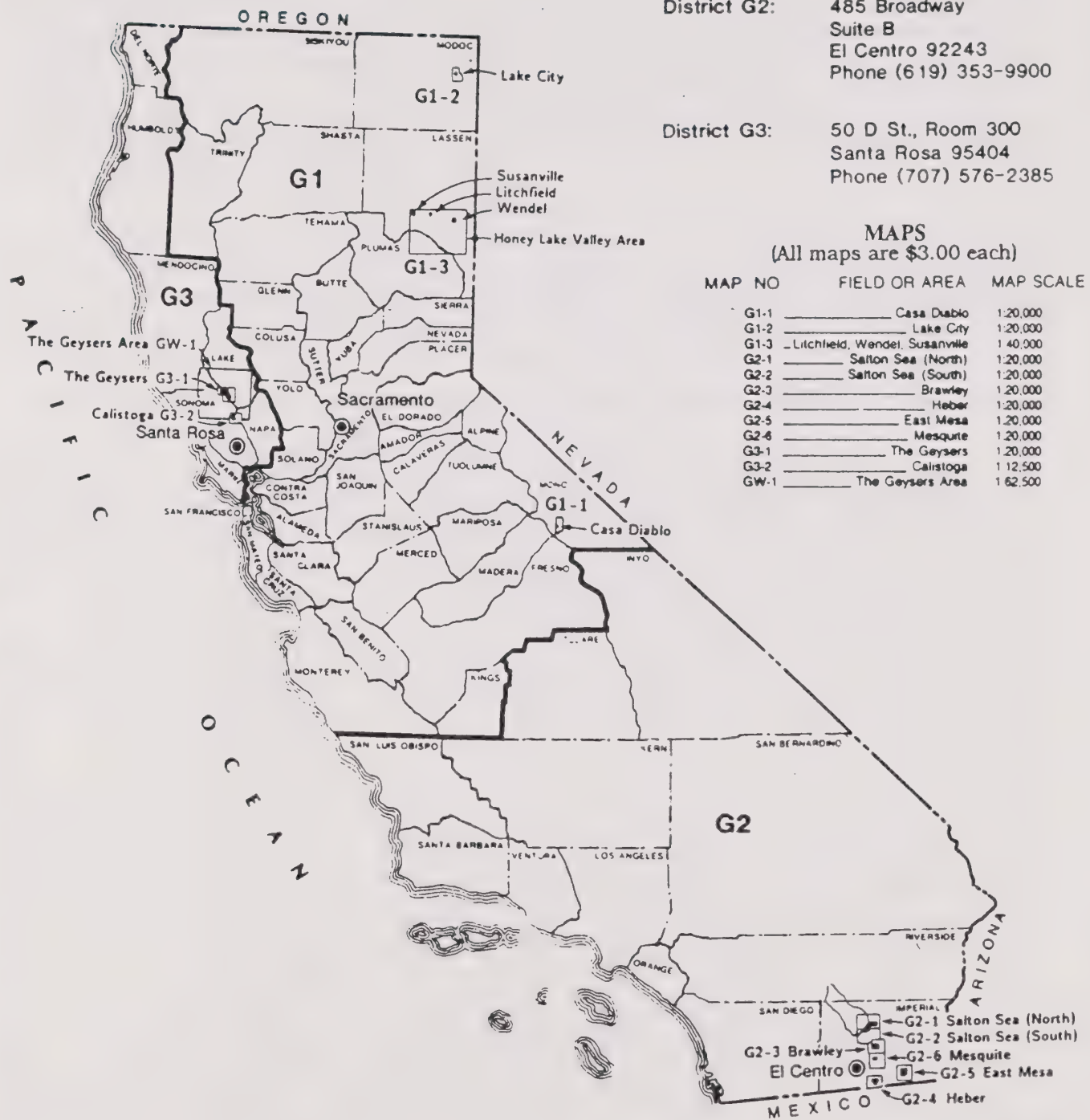
Headquarters  
& District G1: 1416 Ninth St., Room 1310  
Sacramento 95814  
Phone (916) 323-1788

District G2: 485 Broadway  
Suite B  
El Centro 92243  
Phone (619) 353-9900

District G3: 50 D St., Room 300  
Santa Rosa 95404  
Phone (707) 576-2385

## MAPS (All maps are \$3.00 each)

MAP NO	FIELD OR AREA	MAP SCALE
G1-1	Casa Diablo	1:20,000
G1-2	Lake City	1:20,000
G1-3	Litchfield, Wendel, Susanville	1:40,000
G2-1	Salton Sea (North)	1:20,000
G2-2	Salton Sea (South)	1:20,000
G2-3	Brawley	1:20,000
G2-4	Heber	1:20,000
G2-5	East Mesa	1:20,000
G2-6	Mesquite	1:20,000
G3-1	The Geysers	1:20,000
G3-2	Calistoga	1:12,500
GW-1	The Geysers Area	1:62,500



SOURCE: Dec. 1989 Geothermal Hot Line

NO SCALE



Imperial County  
General Plan

California's Known  
Geothermal Resource Areas

Geothermal and Transmission Element

Figure  
2



## E. Existing Geothermal Power Plant Developments

The 1977 Geothermal and Transmission Plan estimated that 4500 megawatts of electricity could be generated by the year 2020 from the Salton Sea, Heber, Brawley, and East Mesa anomalies. The 4500 megawatts of electricity were estimated then to utilize only 15 to 20 percent of the available geothermal resources. The remainder was projected for non-electrical purposes. Because of relatively lower costs for other energy sources, geothermal development projections are now significantly lower than in past years. An increase in the cost of fossil fuel and/or improved technology could accelerate development. Appendix D provides detailed information about potential development strategies for geothermal resources.

Geothermal power plants are being operated in the East Mesa, Heber, and Salton Sea KGRAs. In 1992, the Geothermal Resources Council estimated that these plants produced enough electrical energy to supply power to 400,000 persons. This represents the energy equivalent of about 4 million barrels of oil per year, which would have a present value of approximately \$80 million. Table 2 summarizes the operating status of the powers plants in these KGRAs.

TABLE 2 GEOTHERMAL PROJECTS/IMPERIAL COUNTY <sup>1</sup>				
KGRA	Power Plant	MW Size/Type	Field Operator	On-Line Date
East Mesa	Gem 1	9 MW/Binary	GEO E.M. Ltd.	1980
	Gem 2	21.5 MW/Flash	GEO E.M. Ltd.	May 1989
	Gem 3	21.5 MW/Flash	GEO E.M. Ltd.	May 1989
	Ormesa I	24 MW/Binary	PSC Geoth.	Dec. 1986
	Ormesa II	18 MW/Binary	Ormesa Oper.	Dec. 1987
	Ormesa IE	8 MW/Binary	PSC Geoth.	Dec. 1988
	Ormesa IH	6 MW/Binary	PSC Geoth.	Dec. 1989
Salton Sea	Unit 1	10 MW/Flash	UNOCAL	Feb. 1982
	Unit 2	18 MW/Flash	UNOCAL	Dec. 1990
	Unit 3	47.5 MW/Flash	UNOCAL	Jan. 1989
	Vulcan	34 MW/Flash	Vulcan/Magma	Dec. 1985
	Del Ranch	38 MW/Flash	Red Hill/Magma	Oct. 1988
	Elmore	38 MW/Flash	Red Hill/Magma	Nov. 1988
	J. Leathers	38 MW/Flash	Red Hill/Magma	Nov. 1989
Heber	HGC	47 MW/Flash	Heber Field Co.	July 1985
	SIGC	33 MW/Binary	Heber Field Co.	June 1993
<sup>1</sup> There are other permitted projects, but have not been constructed to date. Contact the Planning/Building Department for further information.				





Concurrent with construction of the Heber Geothermal Company's (HGC) dual flash plant, a 45 MW binary geothermal plant was constructed under a cooperative agreement between San Diego Gas and Electric Company and the Department of Energy. It began operation in 1985 for a planned 2-year full load demonstration period. The plant operated intermittently, with a maximum net output of 22 MW, and was shut down in 1987 due to operational problems and contractual disagreements. A second Imperial Geothermal Company, a 33 MW (net) Binary Facility, was permitted in July, 1992 just north of the SDG&E Binary Facility.

#### **F. Geothermal Resource Development Regulation**

A wide variety of federal, state, and local agencies regulate and monitor geothermal exploration and development in Imperial County and their responsibilities often overlap. Government agencies use permits to exercise their discretionary power or require developers to conform to regulatory conditions. The permits require developers to conform with all agency regulations and regulatory conditions established by other agencies with jurisdictional purview. All discretionary decisions for permits must be preceded by appropriate environmental review pursuant to the California Environmental Quality Act (CEQA) and/or the National Environmental Protection Act (NEPA). Permits often stipulate conditions to mitigate potential environmental impacts and monitoring programs to assure conformance to permit conditions over time.

State law designates the California Division of Oil and Gas (CDOG) as the lead agency for geothermal exploration projects on land under the jurisdiction of the State or the County. While the CDOG exercises this authority in other counties, they have designated the Imperial County Planning/Building Department to act as lead agency for geothermal exploration projects. The Planning/Building Department also serves as the lead agency for geothermal power plant projects that generate less than 50 megawatts (net capacity). The California Energy Commission (CEC) is the lead agency for power plants that generate more than 50 megawatts (net capacity). The Bureau of Land Management (BLM) is the lead agency for geothermal exploration and development projects on lands under federal jurisdiction.

The County, through the Planning/Building Department, regulates the use of land for geothermal purposes through zoning and conditional use permits (CUPs). For geothermal projects CUPs are also referred to as "geothermal permits". The County Zoning Ordinance includes the Geothermal Overlay Zone which is applied by ordinance of the Board of Supervisors, following a recommendation by the County Planning Commission. The County also acts as "lead agency" in their preparation of environmental documents.

A geothermal permit is a land use permit specific to a designated parcel of land which allows well drilling, facility construction, and use, subject to compliance with specified conditions of approval. The permit runs with the land and the project cannot be moved to another location without approval of a separate CUP application and site-specific environmental analysis.

The following agencies are also involved in permitting or regulating geothermal projects: Federal Energy Regulatory Commission; Public Utilities Commission; Department of the Navy; State Lands Commission; State Water Resources Control Board; State Department of Fish and Game; Regional





Water Quality Control Board; County Air Pollution Control District; and Imperial Irrigation District. A detailed description of the permitting process and the agency roles are located in Appendix B.

## **G. Issues Relating to Geothermal Development**

The following issues were identified in the adopted (1990) Geothermal and Transmission Plan. These issues serve as the basis for the Goals and Objectives contained in Chapter III of this Element.

### **1. Preservation of Agricultural Lands and Biological Resources**

With the gradual construction of geothermal plants, overall agricultural production levels should not be adversely affected. However, since some prime farmland will be affected, it is essential that any impacts be minimized. Careful planning, analysis of potential impacts and mitigation measures, and development can minimize impacts and in some cases can benefit biological resources.

### **2. Water Use and Conservation**

The development of the geothermal resource requires water for cooling and injection. Agricultural and biological resources are dependent on water. The Imperial Irrigation District has continually maintained a policy of allocating canal (Colorado River) water to geothermal development. Water sufficient to serve the needs of geothermal projects may become available without impinging upon the water usage of agriculture.

The trend appears to be for water self-sufficiency, through the use of condensate, for about two-thirds of all future projects, as well as for other uses. Since the amount of condensate and/or saved water available for geothermal use is hard to estimate, County decisions will need to be guided by water use policies which consider beneficial water use for geothermal development, agriculture, and fish, wildlife, and recreational resources.

### **3. Subsidence**

Agricultural operations within the County depend on gravity-fed irrigation, drainage, and tiling systems. These systems utilize existing land contours and have little tolerance for change. Areas away from the irrigated fields, canals, and drains may be less sensitive to land surface elevation change. Land subsidence caused by geothermal production/injection activities would be a potentially serious impact of development unless mitigation measures are undertaken.

Well field programs covering production and injection plans are required by the Bureau of Land Management and the Division of Oil and Gas for each major geothermal project. Detrimental subsidence from geothermal development needs to be avoided through careful permit review by CDOG and the County, establishment of standards for each project, and through impact mitigation and monitoring programs.



#### **4. Transmission Line Siting**

The collection system and any transmission line exporting power from Imperial County may impact agricultural lands, wildlife, and the natural desert landscape. The planning and design of these lines should take into consideration these factors.

#### **5. Resource Maximization**

The County desires efficient utilization and production of the geothermal resource. The California Division of Oil and Gas has the necessary technical expertise and has a mandate to conserve the resource. Working jointly, the County will seek to develop and extend the resource's productive life.

#### **6. Master Environmental Impact Reports (MEIRs)**

The County has approved MEIRs for the Salton Sea, North Brawley, South Brawley, and Heber anomalies. MEIRs consider cumulative environmental impacts for the total anticipated level of development within an anomaly. Major geothermal development in other anomalies on non-federal lands may require a zone change and EIR for which MEIRs should be prepared.

#### **7. Direct (Non-Electrical) Heat Uses**

The County of Imperial seeks to also stimulate economic development activities through direct heat processes. In a comprehensive study (*Geothermal Direct Heat Study*, May 1983) potential uses of direct heat were identified. Substantial and important benefits could result from the development of these primarily labor-intensive and agriculturally-related direct heat applications. Benefits would include increased employment, tax revenues from capital improvements, and sales taxes from increased demand for local goods and services.

#### **8. Economic, Fiscal, and Social Impacts**

The County intends to maximize local economic benefits and minimize negative impacts of geothermal development. The benefits include increased direct and indirect job growth and associated improvement to the standard of living of many local residents. This can be accomplished at minimal cost to local government if the costs of monitoring, mitigation programs, and regulation are paid by the geothermal industry.

#### **9. Seismicity**

Imperial County is subject to a high level of natural seismic activity. Events range in magnitude from very small (detectable only by sophisticated monitoring equipment) to larger events capable of causing substantial surface damage. Scientific evidence indicates that human activities can modify natural seismicity, but the occurrence and seriousness of any induced effects related to geothermal development are unknown. In order to determine the effects of geothermal development on natural seismicity, the collection of precise seismic data is necessary for proposed geothermal projects.





## **10. Waste Disposal**

The County will continue to coordinate efforts by the geothermal industry, federal and state agencies, and County Departments for the environmentally safe disposal of geothermal solid and liquid effluent of geothermal development, whether naturally occurring or otherwise.



### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

The Geothermal and Transmission Element of the General Plan serves as the primary policy statement by the Board of Supervisors for implementing development policies for geothermal land uses in Imperial County. This section (Chapter III) of the Geothermal and Transmission Element presents Imperial County's Goals and Objectives relative to geothermal development within the unincorporated areas of the County. They are based on the goals and objectives of the adopted (1990) Geothermal and Transmission Plan which was prepared in collaboration with the Geothermal Industry Advisory Committee.

The Goals and Objectives, together with the Implementation Programs and Policies in Chapter IV, are the statements that shall provide direction for private development as well as government actions and programs. Imperial County's Goals and Objectives are intended to serve as long-term principles and policy statements representing ideals which have been determined by the citizens as being desirable and deserving of community time and resources to achieve. These Goals and Objectives, therefore, are important guidelines for geothermal and related land use decision making. It is recognized, however, that other social, economic, environmental, and legal considerations are involved in land use decisions and that these Goals and Objectives, and those of the other General Plan Elements, should be used as guidelines but not doctrines.

#### **B. Goals and Objectives**

##### **Development of Geothermal Resources**

Goal 1: The County of Imperial supports and encourages the full, orderly, and efficient development of geothermal resources while at the same time preserving and enhancing where possible agricultural, biological, human, and recreational resources.

##### **Agricultural Lands and Biological Resources**

Goal 2: The County will minimize all impacts to agricultural lands and biological resources that could potentially result from the development of geothermal resources.

Objective 2.1 Site and design production facilities to lessen impacts on agricultural land and biological resources.

Objective 2.2 Require the use of directional drilling and "islands" in irrigated and sensitive or unique biological areas.

Objective 2.3 Utilize existing easements or right-of-ways and follow field boundaries for liquid transmission lines.

Objective 2.4 Carefully analyze the potential impacts on agricultural and biological resources from each project.



Objective 2.5 Consider relocating or creating new habitat as might be appropriate.

## **Efficient Water Use**

Goal 3: Geothermal operations will be required to efficiently utilize water.

Objective 3.1 Maintain at least the present level of agricultural production while encouraging efficient water use.

Objective 3.2 Provide for geothermal water use of 180,000 acre-feet of water per year; geothermal development will have first priority for use of "saved" and/or excess water over other uses over which the County has jurisdiction.

Objective 3.3 Encourage the efficient utilization of water in geothermal operations, and foster the use of nonirrigation water by the geothermal industry.

Objective 3.4 Encourage recognition of the importance of water to fish and wildlife resources; and the recreational uses of Imperial County.

## **Land Subsidence Prevention**

Goal 4: The County will actively minimize the potential for land subsidence to occur as a result of geothermal operations.

Objective 4.1 Require that all geothermal operations be conducted so that subsidence or other surface impacts detrimental to existing land uses will not occur.

Objective 4.2 Establish injection standards for each project that are consistent with the requirements of CDOG. Request a CDOG subsidence review, if necessary, for consideration prior to setting injection standards.

Objective 4.3 Require permittees to establish and monitor subsidence detection networks in areas that could be affected by permitted project activities.

Objective 4.4 Require other monitoring programs, if necessary, for determining the possibility or extent of induced subsidence.

Objective 4.5 Require corrective measures, as necessary and in proportion to each developer's activities, if evidence indicates that geothermal operation has caused or will cause surface detriment. In determining monitoring or mitigation requirements, the County may consult with informed parties such as the Division of Oil and Gas, the permittee, other developers, and other experts as appropriate.

Objective 4.6 Where fields have been unitized, or developers have established a cooperative agreement for reservoir management, specific production and injection requirements of individually-permitted project may be modified in accordance with CDOG requirements.





### **Locating Transmission Line Corridors**

Goal 5: When planning and designing transmission lines, the County will consider impacts to agricultural lands, wildlife, and the natural desert landscape.

Objective 5.1 Require all major transmission lines to be located in designated corridors.

Objective 5.2 Design lines for minimum impacts on agriculture, wildlife, urban areas, and recreational activities.

Objective 5.3 Construct transmission lines in accordance with this Element.

### **Efficient Use of Geothermal Resources**

Goal 6: The County will require the efficient utilization and production of geothermal resources in Imperial County.

Objective 6.1 Provide information concerning the anticipated life of each geothermal facility.

Objective 6.2 Insure any proposal for large scale injection of non-geothermal fluids is reviewed by the Division of Oil and Gas and implemented so as to prevent detrimental impacts to geothermal reservoirs.

### **Anomalies on Non-Federal Lands**

Goal 7: The County will prepare Master Environmental Reports (MEIRs) for anomalies on non-federal lands.

Objective 7.1 Prepare MEIRs as needed to evaluate potential development and impacts in the anomaly.

Objective 7.2 Seek reimbursement for the costs of the preparation of MEIRs for the area being rezoned from applicant, industry, and governmental sources.

### **Encourage Direct Heat Processes**

Goal 8: The development of non-electrical uses of geothermal resources will be encouraged and facilitated by the County for economic development purposes.

Objective 8.1 Encourage and facilitate the development of non-electrical uses of geothermal energy for economic development purposes.

### **Maximize Economic, Fiscal, and Social Benefits**

Goal 9: Every effort will be made to maximize economic, fiscal, and social benefits and minimize negative impacts of geothermal resource development.



Objective 9.1 Determine the services needed and related effects of geothermal development.

Objective 9.2 Consider the benefit to cost ratio and economic effect of County mandated monitoring and mitigation programs.

Objective 9.3 Determine the costs incurred by the County in regulating and monitoring geothermal energy development.

Objective 9.4 Assure that revenues resulting from geothermal development are sufficient to offset costs to the County of that development.

Objective 9.5 Encourage employment of County residents by the geothermal industry wherever and whenever possible.

Objective 9.6 Encourage the establishment of necessary applicable geothermal training programs in local school systems in cooperation with the geothermal industry.

### **Zoning Administration**

Goal 10: The County will create and implement appropriate zoning for geothermal resource development.

Objective 10.1 Efficient permitting and review procedures are appropriate to the various types of geothermal exploratory and development projects.

Objective 10.2 Major production activities on non-federal lands are allowed only in a geothermal overlay zone and by a Conditional Use Permit containing appropriate performance standards.

Objective 10.3 Geothermal overlay zones are based on data indicating the existence of a viable resource.

Objective 10.4 Each zone is established according to good planning practices; properly related to the known resource and proposed developments, recognizing other land uses, avoiding formations of corridors or islands, and following legal lot lines.

### **Public Information**

Goal 11: The County will provide adequate information about geothermal resources and development to the public.

Objective 11.1 Conduct public forums to allow information concerning geothermal development to be circulated between industry, county staff, and the public.

Objective 11.2 Provide the public adequate opportunity to inform themselves on the current status of geothermal development and to express their opinions on matters pertaining to the development of the resource.





## Effects on Natural Seismicity

Goal 12: The effects of geothermal development on natural seismicity will be determined by the County.

Objective 12.1 Require that seismic monitoring be performed in conjunction with major geothermal projects as necessary.

Objective 12.2 Request the developer to analyze seismic data to determine effects of geothermal production and injection on seismic activities within the development area.

Objective 12.3 Consult with experts, such as Division of Oil and Gas, U.S. Geological Survey, geothermal industry representatives, permittees, and other developers to determine monitoring and mitigation requirements.

### C. Relationship to Other General Plan Elements

State law mandates seven plans or "elements" for local government general plans. Although the Geothermal and Transmission Element is not mandatory, it must comply with requirements that are requisite to all parts within a general plan. Legislative intent must be fulfilled as set forth in Government Code, Section 65300.5: "...the General Plan and the parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency."

The Geothermal and Transmission Element Policy Matrix (Table 3) identifies the relationship between the Geothermal and Transmission Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 3 GEOTHERMAL ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Open Space Conservation	Water
Land Use Planning	X						X	
Agriculture/Biology	X					X	X	
Water Use							X	X
Land Subsidence					X		X	
Transmission Line Corridors	X						X	
Use of Geothermal Resources								
Direct Heat Processes								
Zoning	X							
Natural Seismicity					X			



## **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

### **A. Preface**

Data analysis for the adopted 1990 Geothermal Plan disclosed that the cumulative effects of local geothermal development will be less than was projected in 1977, 1985 and 1990. At the time of the preparation of the 1985 plan, it was projected that 3000 MW would be generated by the year 2015. The resulting document and environmental impact report projected the "worst case" scenario for this development. The 1990 revision lowered the future projection to 1950 MW's.

The current projection of 1950 MW by the year 2000, provides a lower level of environmental disturbance, less geothermal waste, and fewer impacts on humans and on wildlife. These projections will therefore reduce environmental, social, agricultural, and/or other related impacts.

This Chapter of the Geothermal and Transmission Element builds upon the Goals and Objectives of Chapter III which establishes County policies on:

- Development of Geothermal Resources
- Agricultural Lands and Biological Resources
- Efficient Water Use
- Land Subsidence Prevention
- Locating Transmission Line Corridors
- Efficient Use of Geothermal Resources
- Anomalies on Non-Federal Lands
- Encourage Direct Heat Processes
- Maximize Economic, Fiscal, and Social Benefits
- Zoning Administration
- Public Information
- Effects on Natural Seismicity

Described in this Chapter are implementation programs for activities under the purview of the County Planning/Building Department and other County agencies, including use of the Geothermal Overlay Zone pursuant to the County Zoning Ordinance.

### **B. Assumptions**

Based on current data and updated growth scenarios, County staff has made certain assumptions concerning the future. The following assumptions were utilized in the preparation of this plan:

- It is assumed that electrical demand will increase during the 1990's and beyond in Imperial County, Southern California, and the entire state.
- It is assumed that electricity developed from geothermal energy will become competitive in cost with electricity developed from other sources as technology advances, costs decrease, and cost of other energy sources increases.



- It is assumed that an adequate and satisfactory source of cooling water will be available for geothermal development.
- It is assumed that 1950 megawatts of electrical generation will be developed in Imperial County.
- It is assumed that geothermal electrical development will take place gradually unless circumstances dictate otherwise.
- It is assumed that a variety in type and size of direct heat uses will be developed, that they will be predominantly agriculturally-related, and will be more labor-intensive than electricity generation.
- It is assumed that the County of Imperial will retain a leading role in guiding and regulating development of the geothermal resource in Imperial County.
- It is assumed that geothermal development will continue to be environmentally acceptable with adequate protection of agricultural land uses, wildlife, local residents, and other natural resources.

### **C. Programs and Policies**

In order to implement the policies set forth in the previous section, the County will:

1. Maintain an updated Zoning Ordinance including regulations for geothermal projects, a geothermal development zone, and definitions of the resource, wells, facilities and projects.
2. Require applications for Conditional Use Permits and/or zone changes to include, but not be limited to:
  - a. A comprehensive project description.
  - b. A conceptual scenario for the ultimate development of the anomaly, or how the project will fit into existing scenarios.
  - c. A statement of measures to be taken to preserve and protect agricultural land and the environment.
  - d. A description of any steps the applicant may have taken to cooperatively develop the anomaly with other developers and leaseholders as appropriate.
  - e. A general description of production and injection plans for the project.
  - f. The proposed source of cooling water for the project.
3. Include new projects into the existing subsidence, seismicity and air quality monitoring networks.





4. Periodically evaluate the findings of each environmental monitoring program to determine if:
  - a. mitigation measures are necessary,
  - b. the monitoring program should be modified,
  - c. results demonstrate that the monitoring program is unnecessary.
5. Periodically review insurance and bond requirements to establish appropriate levels of protection.
6. Coordinate County planning and regulation of geothermal activities with other governmental agencies as necessary.
7. Develop procedures to assure County input on projects for which other governmental agencies are "lead agency" or the approving authority, and to insure continuity of enforcement in the event of such agency's failure or inability to exercise their authority.
8. Maintain "master" environmental impact reports (MEIRs) and prepare new ones as necessary for areas with substantial anticipated geothermal development.
9. Periodically review utility transmission corridor plans with the Imperial Irrigation District, other utilities, and geothermal industry representatives to determine if plans are adequate.
10. Determine the costs of processing applications, and performing inspections and monitoring (including major monitoring projects), passing costs on to geothermal developers through appropriate fees.
11. Assure that adequate waste disposal facilities are available for materials not injected or recovered for useful purposes.
12. Facilitate the development of cascaded/direct heat utilization of geothermal energy.
13. Review and advise on necessary occupational skill levels required for employment in the geothermal industry and encourage educational institutions and industrial companies to offer appropriate courses and training programs.
14. Keep the public informed on geothermal development in Imperial County with periodic informational programs.



15. Cooperate and participate in studies, as appropriate, of:
  - a. public services and facilities needed as a result of geothermal development.
  - b. technical developments and changes in facility operations which might require changes in County policy or regulations.
  - c. water resources for geothermal facility use with Imperial Irrigation District.
  - d. means and incentives to develop cascaded or direct heat industries in Imperial County for economic development.
  - e. possible legislative incentives to accelerate resource development in Imperial County.
  - f. options available for utilization of geothermal revenues for staffing and monitoring purposes.

#### **D. Land Use Designations**

The County Zoning Ordinance (Section 83226) includes the Geothermal Overlay ("G") Zone which permits minor geothermal projects and wells; and, by Conditional Use Permit, allows major and intermediate geothermal projects, geothermal test facilities, and major geothermal exploratory wells. There are presently four designated Geothermal Overlay Zones in Imperial County totaling 147,444 acres: Salton Sea, 111,444 acres; North Brawley, 14,000 acres; South Brawley, 15,000 acres; and Heber, 7,000 acres. Five other KGRAs, East Brawley, East Mesa, Westmorland, Glamis, and Dunes, are not presently zoned with the "G" Overlay. Total KGRA acreage within the County is approximately 347,941 acres, with 42 percent zoned with the "G" Overlay (see Figure 1 and Table 1). As development increases and new rezone applications are made by developers, other "G" Zones may be designated.

#### **E. Implementation Standards**

Appendix B is titled "Standards for Geothermal Projects in Imperial County" and establishes definitions, conditions and performance standards applicable to the various types of geothermal projects. Conditional Use Permits (CUPs) issued for specific projects and regulations administered by other agencies may contain stricter, different and/or additional conditions than those enumerated therein. Unless modified by the specific written provisions of a permit, the conditions enumerated in Appendix B shall be complied with for all geothermal projects.

##### **1. Land Use**

Land use standards include requirements for application and review of CUPs and related land use requests in order to assure that geothermal development is conducted in a manner which assures that the location, size, design, and operating characteristics will be compatible with and not materially detrimental to adjacent uses, residents, farm operations, or natural resources.





General and specific standards include preservation of farm operations by minimizing surface land usage for geothermal exploration and facilities, and by avoiding disruption to existing irrigation and drainage patterns; maintain adequate setbacks from property lines, streets, and in particular, noise sensitive land uses such as residences, schools, and hospitals; avoid nuisance and unsightly conditions with appropriate limits on hours of operations, light control, and adequate fencing and landscaping; and establish proper procedures for system shutdown and site abandonment.

## **2. Health and Safety**

A number of health and safety considerations are involved in geothermal development. General and specific standards in Appendix B include requirements relative to compliance with air quality and dust control standards; avoidance of geologic, soil, and hydrology hazards through seismic and subsidence monitoring, protection of surface and groundwater quality, and proper disposal of wastes; and proper operating procedures including appropriate routing of pipelines and electrical transmission lines; noise control management, safe use of public roads for equipment transport, and maintaining an Emergency Response Plan covering incidents such as blow-outs, major fluid spills, earthquakes, fires, and other emergencies.

## **3. Environmental**

The design, siting, and operation of geothermal facilities shall give adequate consideration to potential direct and indirect environmental impacts pursuant to the California Environmental Quality Act (CEQA). General and specific standards in Appendix B include requirements relative to aesthetics, air and water quality, biological impacts, archaeological and cultural impacts, protection of agriculture, noise control, and public safety.

## **4. Monitoring and Management**

In order that good planning and design are not negated by ineffective implementation, Appendix B includes standard requirements for compliance with all applicable laws and regulations, with bonds, fees, and insurance requirements to insure proper performance by geothermal operators. Also required are inspection and entry rights, identification of a responsible agent for all operations conducted, and provision for permit revocation or limitation due to non-compliance.



## APPENDIX A

### HISTORY OF GEOTHERMAL USE AND DEVELOPMENT

The usage of California geothermal resources started at many of the hot springs found throughout the state. At these springs, Indians and then later settlers gathered to use and enjoy the warm waters. By the late 1800's, some hot springs were commercialized.

Surface geothermal phenomena has been noted in Imperial County for many years. The famous "mud pots" of the Salton Sea, steam fumaroles, and boiling springs were observed near Mullet Island which is a volcano that erupted about 16,000 years ago.

In 1905, the Colorado River broke through earth closure works in a newly constructed intake channel and waters from the river flowed into Imperial and Coachella Valleys for more than a year. The uncontrolled water formed the Salton Sea. Many of the "mud pots" and other natural phenomena were covered, but their manifestations are visible on the sea's surface in a number of locations.

The initial attempts at utilizing the underground resources of the County commenced when three wells were drilled on Mullet Island in 1927-1928 by the Pioneer Development Company exploring for the Southern Sierra Power Company. The deepest well was drilled to 1,473 feet and reached a maximum temperature of 245° F. All three wells produced steam, hot water, and noncondensable gases; however, steam pressures and volumes were not considered sufficient for commercial use, and the wells were abandoned.

While these were being sunk, large quantities of carbon dioxide gas was produced. This led to the formation of the Salton Sea Products Corporation which began exploring for carbon dioxide gas. In 1932 the discovery well for the Imperial Carbon Dioxide field was drilled about a mile northeast of Mullet Island. The field produced commercial carbon dioxide gas from 1933 to 1954, and the gas was recovered from shallow sands 200 feet to 700 feet deep. Two plants were built in the field to convert the carbon dioxide to dry ice. The field was abandoned in 1954 because of depletion of the producing sands, the rising level of the Salton Sea, and the development of modern refrigerated transport systems.

In 1957, Kent Imperial Corporation drilled "Sinclair 1" which is considered to be the discovery well for the Salton Sea Geothermal field. This well produced substantial amounts of geothermal fluids. It was drilled as an oil well to 4,725 feet. When it was tested, it produced hot water and steam. A small pilot electrical generation plant was installed at the wellhead in 1959. However, this test facility was shortly abandoned due to the deposition of minerals on the equipment forcing a shutdown.

The first geothermal exploratory well intended to locate a resource was "Sportsman 1", by Joseph I. O'Neil, Jr. It was drilled in 1961 to 4,729 feet, about 4 miles northeast of "Sinclair 1". From 1961 to 1964, 10 more geothermal wells were drilled in the vicinity and 8 produced geothermal fluids. The mineral content of these wells was very high, occasionally reaching concentration of



over 300,000 ppm total dissolved solids. The brine was slightly caustic and production was hampered by severe corrosion and scaling.

The Morton Salt Company (Imperial Thermal Products, Inc.) and Union Oil Company erected small pilot plants in an effort to extract minerals from the brine. After a few years of experimentation with brine and electrical production, these ventures were terminated as uneconomical.

From 1965 to 1970, the University of California at Riverside conducted an intensive investigation of the Imperial Valley. The research culminated in a report entitled *Cooperative Geological-Geophysical-Geochemical Investigations of Geothermal Resources in the Imperial Valley Area of California*, dated July 1, 1971. This program was supported by many organizations, including the U.S. Bureau of Reclamation, the National Science Foundation, Standard Oil Company of California, the Chevron Oil Field Research Company, the Imperial Irrigation District and the United States Department of Energy.

Since 1912, when G. Hoyt drilled a 6-inch well approximately 475 feet deep, Imperial County has had numerous entrepreneurs, oil companies, and private landowners drill wells throughout Imperial Valley searching for viable economic resources such as oil, gas, geothermal resources, and minerals. This search continues today with exploratory applications being made in various areas in Imperial County.

Numerous studies through the years have been made of the resource and the resource characteristics in the Salton Trough including: temperatures and temperature gradients, ground levels and slopes, seismicity, isotopic studies of groundwater and hydrology of underlying waters, gravity anomalies, magnetic anomalies and stratigraphic geology.





## APPENDIX B

### STANDARDS FOR GEOTHERMAL PROJECTS IN IMPERIAL COUNTY

#### A. Introduction

The Board of Supervisors and the Planning Commission of the County of Imperial have adopted: 1) a Geothermal and Transmission Element as part of the County General Plan which establishes County policy and implementation measures regarding the exploration for and development of geothermal resources; and, 2) a Geothermal Ordinance which establishes the basic regulatory structure for zoning and permitting for geothermal projects in the County.

Pursuant to the provisions of Title 8, Division 3, Chapter 6 of the Codified Ordinances of Imperial County, the "Terms, Conditions, Standards, and Application Procedures for Initial Geothermal Development, Imperial County", adopted May 18, 1971, by Minute Order No. 8, Book 115, Page 109, are hereby rescinded and replaced by these "Standards for Geothermal Projects in Imperial County".

These standards establish definitions, conditions and performance standards applicable to the various types of geothermal projects in addition to those provided for in the Element, Ordinance and other applicable regulations. Conditional Use Permits (CUP's) issued for specific projects may contain stricter, different and/or additional conditions than those enumerated herein. Unless modified by the specific provisions of a permit, the conditions enumerated in these standards shall be complied with for all geothermal projects. For clarity, certain portions of the text from the Element, Ordinance, or other applicable regulations may be repeated herein.

#### B. Definitions

**Approving Authority:** The decision-making body or official designated by the Geothermal and Transmission Element, Board Resolution, or by Ordinance to approve geothermal permits. In most cases, this will be the Board of Supervisors, Planning Commission, Planning Director, or other official as may be designated.

**Community Noise Equivalent (CNEL):** This is a composite and weighted average noise evaluation measure developed by the U.S. Environmental Protection Agency to describe the noise environment over a 24-hour period. Noises which occur from 10 p.m. to 7 a.m. on the "A" scale have added to them a weighting of 10 decibels for this period and a weighting of 5 decibels for the period from 7 p.m. to 10 p.m. to account for people's increased sensitivity to noise at night.

**Geothermal Well:** Any well whose intended purpose is the discovery, test, production, disposal, or use of geothermal resources; or any well which encounters or produces resources over 140 degrees F or with over 10,000 parts per million total dissolved solids; or any well which is used to inject fluids into a known geothermal reservoir. All permits for geothermal projects shall indicate the maximum number of wells to be maintained and the maximum number of wells to be used. Any



well "spudded" but not completely "abandoned" in accordance with law, shall count as a well being maintained regardless of its use or condition.

**Major Project:** Any reference to a Major Project also includes an Electric Generation Project.

**Operator:** means any person, firm, or corporation drilling, maintaining, operating, pumping, or in control of any well or related facilities for power generation, mineral extraction, desalinization or any other use of geothermal resources; or conducting any activity under the authority of a permit issued for a geothermal project.

**Replacement Well:** A geothermal well drilled to replace another well which is no longer maintained and is legally abandoned, or a geothermal well drilled to maintain a constant energy supply to a consuming facility necessitated by declining production from the original supply wells.

**Sound Level Measurement:** The sound pressure level measured with a sound level meter and associated octave band analyzer, conforming to the standards prescribed hereinafter, and by the American National Standards Institute relating to sound and noise measurements.

**Standby Well:** A geothermal well maintained ready for use, but which is put into use only upon another well being taken out of use.

### **C. General Standards**

**Application.** Twenty (20) copies of the project application along with the required fees, shall be submitted in compliance with application procedures provided by the Approving Authority with a copy to Imperial Irrigation District, and shall at a minimum include the following:

1. A project description clearly outlining what the project will be and what it will do.
2. A legal description of the land to be used.
3. A precise project location map including adjacent roads and canals.
4. A Plot Plan or Plans (including a reproducible copy) prepared in accordance with good engineering and drafting techniques. The Plan shall show all existing topography and development, including that within a reasonable distance abutting the project, and all proposed development. There shall be a North arrow and adequate legend. The Plan shall be drawn to commonly used engineers scale and be at least 8 1/2" by 11".
5. Assessor Parcel Map Numbers (one copy only showing the project site and all parcels within one-half mile (300' within non-agricultural areas).





6. An influent-effluent table or diagram indicating quantities and characteristics of geothermal resource to be produced and injected, air emissions, liquid and solid discharges, etc., for typical operations and on an annual basis.
7. Amount and type of energy (KW, MW, or BTU) and/or other products to be produced for typical operations and on an annual basis.
8. Geologic, engineering, and/or other evidence that gives reasonable assurance of the success of the project.
9. A timetable for project development.
10. A certification on all applications, reports, or other information requested by the County which shall be signed by the owner or operator; for a corporation this would be a responsible corporate officer or his authorized agent. The persons signing the document shall attest and certify as follows:

"I certify under penalty of perjury that this document and all attachments were prepared under my direction or supervision and the information submitted is, to the best of my knowledge and belief, true, accurate, and complete."

**Aesthetics.** All permanent installations and project premises shall be designed and maintained to be harmonious in appearance, and compatible with the surrounding area.

**Air Quality.** All projects must meet all EPA and Imperial County Air Pollution Control District standards and requirements.

**Approvals and Conditions Subsequent To Granting A Permit.** Where a permit imposes a requirement that an operator conduct a monitoring program and where the County has reserved the right to impose or modify conditions with which the operator is required to prepare specific plans for County approval, and disagreement arises, the operator and/or agent, the Planning Director or other affected party to be determined by the Planning Director, may request that a hearing be conducted before the Approving Authority whereby they may state the requirements which will implement the applicable conditions as intended by the Permit. Upon receipt of a request and appropriate filing fee, the Approving Authority shall conduct a hearing and make a written determination. The Approving Authority may request support and advice from a technical advisory committee. Failure to take any action shall constitute endorsement of staff's determination.

**Archaeological/Cultural Impacts.** If any unusual specimens of bone, stone, or ceramic are discovered during construction, all construction affecting the discovery site shall cease until a qualified archaeologist, retained by the applicant and approved by the Planning Director, reviews the specimens. The recommendations of the archaeologist related to the discovery shall be complied with prior to resuming construction.



**Biological Impacts.** Project construction and operations shall be conducted so as to protect wildlife and other biological resources. The Planning Department shall appropriately inform the U.S. Fish and Wildlife Service and Department of Fish and Game when geothermal applications are accepted.

**Bonds.** Bonds or other forms of security acceptable to the County, in addition to that of the amount set by the California Division of Oil and Gas (CDOG) and approved by that office, shall be filed with the County Planning/Building Department. Said indemnity bond or security shall, as outlined below for single wells or a blanket bond of \$100,000 for any number of wells drilled or re-entered, be furnished which will guarantee restoration of the land to its condition prior to project development or well drilling. Upon completion of such restoration, the bond or security shall be released by the County. The definition and bonding requirements are as follows:

<b>Applicable Amounts</b> <b>(Subject to legislative change)</b>	<b>Cash or Surety Bond</b>
Coverage for high temperature well*	\$25,000
Coverage for low temperature well*	
less than 2,000 feet total depth	\$2,000
at least 2,000 feet but less than 5,000 feet total depth	\$10,000
at least 5,000 feet but less than 10,000 feet total depth	\$15,000
at least 10,000 feet or greater total depth	\$25,000

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\* High temperature well is a well from which fluid produced has a temperature that is more than the boiling point at the altitude of occurrence (e.g., 212° F/100° C at sea level).

**Compliance With Law.** All well drilling, plant construction, testing, and operation of a permitted project shall comply with all applicable local, state, and federal laws and regulations.

**Coordination.** The responsible agent or other designee of any geothermal major exploratory and production project shall participate in the County's "Geothermal Association Industrial Committee". Other operators may be invited to participate as appropriate.

**Emergencies.** There shall be an Emergency Response Plan appropriate to the size and operation of the project covering possible emergencies such as blow-outs, major fluid spills, earthquakes, fires, floods and other emergencies. At all times, there shall be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This Emergency Coordinator shall be thoroughly familiar with all aspects of the facility's Emergency





Response Plan, all operations and activities at the facility, the location of all records within the facility, and the facility layout. This person shall have the authority to commit the resources needed to carry out the contingency plan. Adequate personnel and equipment shall be available to respond to emergencies and to insure compliance with the conditions of the permit. The plan shall be prepared in consultation with the Regional Water Quality Control Board (RWQCB), County Office of Emergency Services, local emergency service agencies, Department of Fish and Game (DF&G), CDOG, public services and other state/county agencies as appropriate. The plan shall include a notification list of response agencies which shall be notified immediately upon the discovery of a reportable unauthorized discharge and the list shall include: Office of Emergency Services, Environmental Health Services, RWQCB, IID, CDOG, DF&G, County Planning, Department of Public Works (DPW), other appropriate County agencies, California Highway Patrol, and/or Sheriff.

**Fees.** The County may establish reasonable fees, in accordance with law designed to reimburse the County for actual costs for reviewing, inspecting, supervising, and monitoring appropriate project activities.

**Geologic Hazards.** No structure meant to be, or which actually is, regularly, habitually, or primarily, occupied by humans shall be placed across the trace of an active fault. Further, no such structure shall be placed within fifty feet (50') of the trace of an active fault, nor anywhere within a seismic special studies zone, unless a geologic report, satisfactory to the State Geologist, is prepared and shows that no undue hazard would be created by construction or placement of the structure.

**Geology/Topography.** Geotechnical investigation of soil characteristics affecting a project shall be performed, as determined by the Planning Director, and results made available to the County upon request.

**Health and Safety.** All project activities shall be conducted in harmony with the area and consistent with requirements of public health, safety, comfort, convenience, and general welfare.

Requirements of traffic safety shall be considered in transporting equipment and materials to project sites, and signs and flagmen shall be used as determined by the Department of Public Works. Transportation of oversize loads on County roads is a problem, therefore such transportation should be minimized. When planning for the transportation of oversize loads, the DPW shall be contacted prior to finalizing shipment plans to ensure that acceptable transportation methods and routes can be developed. Transportation permits shall be obtained from the DPW for oversize loads traveling on County roads.

Appropriate first aid provisions shall be made for emergency response during project construction and operation with appropriate first aid training for project employees.

All activities involving use and storage of flammable and explosive or highly corrosive or reactive materials shall be provided with adequate safety devices against the hazard of fire and explosion and adequate fire-fighting and fire suppression equipment and devices standard in the industry. Relevant





provisions of other state and local laws also shall apply as determined by the County Fire Chief and Office of Environmental Health Services.

**Hydrology.** Project facilities shall be designed to protect surface and groundwater quality. Specific measures may be required as conditions of project operations. Measures to contain potential spills of geothermal fluids shall be incorporated into project design as appropriate. Adequate provisions in project facility plans shall be made for the handling of on-site drainage and de-watering of property in a manner not adversely affecting adjacent properties, to be reviewed by Imperial Irrigation District. Water quality monitoring programs are required by the Regional Water Quality Control Board for geothermal operators.

**Inspection and Entry.** The owner or operator shall allow authorized representatives of the County, upon the presentation of credentials and other documents as may be required by law to:

- a. Enter at reasonable times upon the owner's or operator's premises where a permitted facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
- b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;
- c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under the permit; and,
- d. Sample or monitor, at reasonable times, for the purpose of assuring permit compliance or, as otherwise authorized by law, any substances or parameters at any location.

**Insurance.** For the duration of a major or test project, the operator shall maintain liability in tort and property damage insurance at a minimum of \$1,000,000 or proof of financial responsibility to protect persons or property from injury or damage caused in any way by drilling, construction, or operation of the project. Operator shall require that proper workers' compensation insurance cover all laborers working on the project, during drilling, construction, and operation of the project. Evidence of such insurance shall be provided to the County prior to commencement of any activities authorized by a permit.

Operators of any geothermal project shall indemnify, defend and save harmless the County, its Board of Supervisors, and all officers and agents of the County, against any and from all claims, actions, or liabilities arising all or in part out of the permittee's actions and/or performance involved in the drilling, construction, operation, or abandonment of the project.

Smaller intermediate, minor projects, and exploratory well projects will maintain insurance levels set by the Approving Authority and County Counsel.



**Land Use.** Site development plans and land use areas for geothermal projects shall provide for the minimum feasible surface land usage of the project, preserve farm land and wildlife habitat according to the General Plan, and be compatible with existing uses wherever possible.

**Noise.** The maximum permitted continuous sound level shall be CNEL 60 decibels measured at the nearest human receptor site outside the parcel boundary using the "A" scale and measured with a sound level meter and associated octave band analyzer.

**Non-Compliance.** If operator violates a condition of a County permit, County shall give notice of that violation. If operator does not act to cure that violation, given reasonable notice and opportunity, the County may revoke or limit a permit.

**Operation and Maintenance.** The facility shall be maintained at all times and operated to minimized the possibility of fire, explosion, or any unplanned release of hazardous materials to air, soil, surface water, or ground water which could threaten human health or the ground environment.

- a. All equipment, pipes, tanks and lines used at the production and injection facilities to handle, transfer, pump, or store geothermal fluids or hazardous material shall be maintained in a manner that prevents leaking and spilling.
- b. The owner or operator shall at all times properly operate and maintain all facilities (and related appurtenances). Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

**Other Permits.** The County incorporates by reference the conditions of those permits of other governmental agencies, and reserves the right to apply those conditions, as the County deems appropriate, in the event that any of those other governmental agencies cease or substantially alter their regulatory activities or fail to enforce their own requirements.

**Permit Expiration.** A project permit shall remain valid while the permitted use is occurring pursuant to the permit or until such termination time as is specifically stated in the permit.

**Public Facilities and Services.** If location or site of a project requires additional public access facilities, the operator shall be required to obtain encroachment permits and to provide, where necessary, rights-of-way on property under control of the project and to provide necessary road work.

**Responsible Agent.** There shall be a responsible agent for any activity conducted under the authority of the permit, and the responsible agent for the project shall provide to the County, on request, copies of all permits granted by other governmental agencies in connection with the project. The agent's name, address, and telephone number shall be provided to the County Planning and Public Works Departments.





**Scope of Project.** Except as specifically authorized in the project permit, supplemental activities which require additional major equipment or facilities will require separate permits. The County, in issuing a permit, in no way assures, or otherwise vests any right, with respect to the issuance of a permit or permits for supplemental activities.

For discretionary projects, applications may be denied if the Approving Authority finds the proposal will not be compatible with the area for which it is proposed. Ministerial projects must be consistent with the zoning and general plan designation for the proposed site.

**Seismic Monitoring.** Field developers of major projects, and such other discretionary projects as determined by the Approving Authority, shall participate in the County Seismic Monitoring Program as required by the conditions of the permit. Project monitoring programs may require establishment of a project-specific seismic monitoring network which meets the guidelines of the Department of Public Works. Project developers shall submit a plan for project monitoring to the DPW and shall implement the plan as approved. Reports shall be submitted annually or as designated by the DPW. Such reports would not be available to a third party without specific approval of the developer who submitted the report.

**Submittal of Requested Information.** The owner or operator shall furnish to the County, within a reasonable time, any relevant information which the County may request to determine whether cause exists for revoking this permit, or to determine compliance with this permit.

**Subsidence Monitoring.** Field developers of geothermal projects (except minor exploratory wells), and such other discretionary projects as determined by the Approving Authority shall participate in the County Subsidence Monitoring and Detection Program as required by the conditions of the permit. Project monitoring will consist of establishing benchmarks within the geothermal site and connecting to the County's precise level network. All survey work shall be performed under the direct supervision of a person licensed to practice surveying in California. Work shall conform to National Geodetic Survey and Department of Public Works standards. Project developer shall submit a plan for project subsidence monitoring to the DPW and shall implement the plan as approved by the DPW. Surveying shall be performed annually or as directed by the DPW.

**System Shutdown and Site Abandonment.** When the operation of the permitted project has ceased, all facilities shall be dismantled, all wells capped or abandoned as required by the California Division of Oil and Gas and the land involved be compatible with surrounding uses or as requested by the landowner and as agreed to by the Planning Director.

**Waste Disposal.** Wastes, liquid or solid, shall be disposed of in compliance with local, state, and federal regulations, as appropriate, in effect or subsequently duly enacted. Any discharge of wastes into surface water must meet requirements of the Regional Water Quality Control Board. Extraction of resources from wastes and other recycling of waste is not prohibited. Separate permits for major recycling/recovery facilities are required, unless such facilities are included in a project application.



**D. Specific Standards**

1. All geothermal drilling sites including test facilities and ponds shall be as small as possible and in no case larger than five acres on farmable land. Exceptions may be considered on a well-by-well basis.
2. All geothermal drilling and production sites shall protect as much as possible, the fragile ecological balance of the wetlands and surrounding desert by assuring that natural resources will be considered in their location. Consideration shall be given to intermittent noise levels which may affect wildlife.
3. Every site shall be designed to retain the maximum amount of usable agricultural land and the site shall not interfere with the irrigation and drainage pattern, and shall comply with requirements and regulations of Imperial Irrigation District. Drill sites shall be constructed adjacent to existing roads in so far as possible. Well density shall be justified and in accordance with good Reservoir Engineering Practices.
4. Unless specifically waived by the Approving Authority, where legally permissible, the following minimum distances shall be observed in siting a well:

Outer Boundary of Parcel	100'
Permanent Public Waterway	50'
Public Roads	100'
Residence	300'
School	1320'
Hospital	1320'
Any Other Permanent Structure/Development	300'
Developer shall mitigate any problems whenever they arise.	

5. Production facilities shall, where possible, be located in centralized areas to serve the maximum number of wells. These shall include but are not limited to power plants, extraction plants, and separators.
6. All electric transmission lines shall be constructed in existing rights-of-way whenever possible. When planning transmission lines adjacent to public roads, discussions with the responsible road agency shall be held in order to minimize impacts on existing and future road needs. Power lines outside of the project site are under the jurisdiction of the Imperial Irrigation District.
7. All permanent sumps, brine ponds, waste holding ponds, and any other pond, shall be designed and constructed to meet sound engineering standards and the regulations and requirements of the Regional Water Quality Control Board. Such sumps and ponds shall be designed and constructed under the supervision of a civil engineer registered in California.





**E. Drilling Standards**

1. All geothermal well sites shall have a durable sign having a surface of not less than two square feet and not more than six square feet bearing the current name and number of the well; emergency telephone number of agent; name and/or insignia of the operator and the owner. This sign shall be displayed at all times from the commencement of drilling operations until the well has been abandoned.
2. Each operator shall limit drilling noise to a sound level equivalent to CNEL 60 dB(A). The level shown may be exceeded by ten percent (10%) if the noise is intermittent and during daylight hours. The noise levels shall be measured at the nearest human receptor site outside the parcel boundary.
3. Sound pressure levels shall be measured at the points specified and shall be measured with a sound level meter and associated octave band analyzer conforming to the above standard.
4. Diesel equipment used for drilling within 300 feet of any residence shall have hospital-type mufflers. Well venting and testing at these wells shall be accompanied by the use of an effective muffling device or "silencer".
5. Within sixty days after the completion of the drilling of a well, all drilling wastes must be removed from the drilling site and disposed of in accordance with County and State regulations.
6. Suitable and adequate sanitary facilities as approved by the Imperial County Health Department shall be installed and maintained in a clean and sanitary condition at all times.
7. Drilling operations shall be diligently pursued until each well is completed or abandoned. All drilling equipment including derrick shall be removed from the premises as soon as practicable after completion of any well.
8. Prior to abandonment, it shall be the responsibility of the operator to comply with all regulations of the County and the State Division of Oil and Gas regarding surface and subsurface activities. In agricultural or potential agricultural areas, any brine holding ponds shall be purged of brine, the salts shall be removed from the dikes and bottom, and the berms leveled to the satisfaction of the landowners and the Planning Director.
9. All work in preparation of the site for drilling shall be done between the hours of 7 a.m. and 7 p.m. for any wells within 300 feet of any residence. Exceptions may be made during summer hours to minimize effects of heat with notice to the Planning Director and approval thereof.
10. All unattended well sites shall be enclosed by a steel chain link type fence, six feet high. There shall be no opening below such fence greater than four inches. The gate shall be placed at a non-hazardous location and shall be locked at all times.





11. Off-street parking shall be provided with not less than five spaces for each well site.
12. Lights should be directed or shielded to confine direct rays to the project site and muted to the maximum extent consistent with safety and operational necessity.
13. Drill pipes shall be racked and/or made up between the hours of 7 a.m. to 7 p.m. for wells within 300 feet of a residence. Exception to this is allowed where sound proofing is provided, or during summer hours to minimize the effects of heat with notice to the Planning Director and approval thereof.
14. Fugitive dust emission shall be controlled by dust control measures (e.g., watering), clean gravel, application of soil stabilizers or oil on well site access roads, limiting public access to unpaved areas, and posting roadways with reduced speeds.
15. Impulse noises such as sudden steam venting shall be controlled by discharge through a muffler or other sound attenuating system, as appropriate.
16. All necessary permits shall be obtained prior to drilling.
17. All well drilling, testing, and operations shall be conducted so as to be in harmony with the area and not in conflict with the public health, safety, comfort, convenience and general welfare of County residents.
18. No operator shall operate equipment that affects transmission of radio or television signals.
19. Drilling may be on a 24 hour basis provided the standards above are met.

**F. Production Standards**

1. All grading, permanent foundations, buildings, structures, and other construction work will require a building permit. The fees and procedures will be based on the Uniform Building Code and ordinances adopted by the Board of Supervisors of Imperial County.
2. Continuous and intermittent sound shall be controlled to the levels listed under the Drilling Standards.
3. All on-site roads and parking areas for major and test projects shall be adequately surfaced. On-site parking shall be provided for all employees, customer, or clients.
4. Shrubs, trees and ground cover shall be planted and maintained to compliment the appearance of the project where soil conditions permit as appropriate, and as approved by the Planning Director.



5. All major project off-site collection and injection pipelines shall, if possible, share existing dedicated rights-of-way. All pipelines shall be painted and/or landscaped to blend with the environment. Pipelines may be allowed above grade for maintenance, leak detection, and wildlife movement. For permanent pipelines to be installed adjacent to public roads, project developers shall consult with Department of Public Works and Imperial Irrigation District regarding the proper location of the pipeline in consideration of existing and future road needs.
6. In operations where it is necessary to transport geothermal brines, fluids, etc. across public waters, operators shall employ double-walled pipes and methods for determining when damage has been done to the inner layer of pipe so that corrective measures can be taken; or apply other safety techniques as approved by the Planning Director and after review by the Imperial Irrigation District.
7. All facilities and structures shall be in compliance with guidelines set forth in Federal Air Regulations Part 77 and be marked and lighted in accordance with Federal Aviation Administration standards.





## APPENDIX C

### GEOHERMAL RESOURCE DEVELOPMENT REGULATION

There are numerous governmental entities which monitor and control all aspects of geothermal exploration and development in Imperial County. These entities include federal, state, and local agencies, and they often have similar responsibilities. The agency identification and brief descriptions presented here and in the following sections are intended to clarify the interrelationship of the various governmental levels and entities.

Each of the public agencies having discretionary approval power exercise their discretionary power through the use of permits. For the purpose of implementing their environmental responsibility, the permits issued by such agencies may include:

Any condition or stipulations deemed necessary by that agency, including appropriate mitigation measures within the statutory jurisdiction of the agency; and,

A monitoring program capable of assuring the permittee's conformance with all such conditions or stipulations.

#### **A. County of Imperial**

Imperial County is the local governmental entity which exercises jurisdiction over geothermal development on private and state lands outside of incorporated cities. The County is lead agency for all exploratory and test projects, and for power plant production projects generating less than 50 megawatts (net capacity). The California Energy Commission (CEC) regulates all power plants over 50 megawatts (net).

##### **1. County Environmental Review**

The County acts as the "lead" agency in the preparation of environmental documentation. All projects, including geothermal, must meet the requirements of the California Environmental Quality Act (CEQA). State law designates the Division of Oil and Gas (CDOG) as "lead" agency for CEQA purposes for geothermal exploration projects. Although CDOG exercises this authority in other counties, they have designated Imperial County Planning/Building Department to perform that function for them here.

According to CEQA Guidelines, a lead agency is one which has the "principal responsibility for carrying out or approving a project. . ." The lead agency prepares the environmental document for the project either directly or by contract. A responsible agency is a public agency which also has discretionary approval power over the project, but uses the environmental documentation prepared by the lead agency.



There are three basic types of environmental documentation: Notices of Exemption, Negative Declarations, and Environmental Impact Reports (EIRs). EIRs can be comprehensive Master or Program EIRs or narrowly-focused site specific EIRs.

Imperial County has adopted several Master EIRs (MEIRs) for the major geothermal anomalies. These are useful base documents and reduce documentation for subsequent projects within that geothermal area. The County must adopt "certification" that a MEIR is adequate for each project. Site specific analysis is also prepared for any new project.

## **2. County Land Use Review**

The County regulates the use of land for geothermal purposes through zoning and conditional use permits (CUPs). The Geothermal Overlay Zone is adopted by ordinance. Exploratory, test, and production projects are approved by conditional use permit (also referred to as a geothermal permit), which is a land use permit. The permit does not authorize a person or corporation to drill a well or build a plant, but it does authorize a specific parcel of land to have wells drilled or to have plants built upon it. The permit runs with the land, and the project cannot be moved to another location without a separate application and environmental analysis prepared and approved.

The County exercises authority over all phases of geothermal development on private and state lands and the various permits may be issued on a "project-by-project" basis. All permits require developers to conform with all County regulations as well as regulatory conditions established by other permitting entities. The normal processing time for County permits is:

1. Notice of Exemption	10 days
2. Exploration CUP	1 to 6 Months (depends on project)
3. Production CUP	12 months
4. Rezoning	6 to 18 months
5. Building Permits	30 days

Numerous permits are required to bring a project from the first exploratory well to the full field development and power plant phase. A project may not be required to have more than one discretionary permit from the County, but an applicant may sometimes develop a "project" in phases and submit each phase as a separate permit application. All permits have conditions outlining construction, operation, and monitoring requirements specific to that permit. County permits are not for an unlimited period of time and may expire if not used, or if a specific time limit is included as a condition.

Ministerial permits are those granted without exercise of personal judgement or discretion. These are issued after staff evaluation ensures that a project meets the standards and conditions outlined in the statutes. There are approximately twenty-one ministerial permits from the following: Building Inspection, Fire Department, Road Department, State Department of Industrial Relations, State Department of Transportation, and Federal Communications Commission.





## **B. State Agencies**

### **1. State Lands Commission (SLC)**

The SLC has jurisdiction over the development of mineral resources beneath state lands including those lands owned by other state agencies. There are approximately 40,000 acres of state-owned lands in the County of Imperial, which is about 1.3 percent of all lands in the County. It is estimated that at least 5000 acres may have commercially valuable amounts of geothermal resources. The type of ownership ranges from lands where the state owns both the surface and mineral rights, to lands where the states has sold the surface rights but retained the mineral rights.

The State Lands Commission does not preempt the County in permitting geothermal activities on state lands. A proposed developer on state lands must obtain permits from and comply with all regulations of the County of Imperial.

Application for and issuance of geothermal permits, leases, and on-going lease management activities are handled from the SLC's Long Beach office. There are four methods of using state land for geothermal activities:

- a. **Nonexclusive Geothermal Exploration Permit.** This permit is issued for preliminary geotechnical information gathering. Activities may include geophysical, geological and geochemical exploration including the drilling of temperature gradient holes. The permit is for a period of 18 months and does not give the permittee any preferential right to a geothermal lease. This permit does not normally require any environmental documentation since it is for information gathering without major environmental impacts.
- b. **Geothermal Prospecting Permit.** This permit gives the developer the exclusive right to explore the permit area for a period of two years with a possible two year extension. If a geothermal resource is discovered in commercial quantities the permittee may have a preferential right to a lease under terms agreed to before issuance of the permit. The permit allows drilling of deep exploratory wells and requires environmental impact documentation. This may range from a negative declaration to an EIR depending on the nature, scope and severity of the impacts of the project. The permit requires the drilling of at least one well during the term of the permit and provides for an escalating annual rental per acre until a well has been drilled. This permit is generally issued in areas where the existence and nature of the resource is less well known.
- c. **Leasing by Competitive Bidding.** Generally, these leases are issued in areas where the existence and nature of the resource is well established. Royalty may range from ten percent to sixteen and two-thirds percent of gross revenue from the sale of steam and bidding may be on the basis of cash bonus, net profits, or other factors. The lease requires that a well be drilled within a specified drilling term.





- d. **Negotiated Leasing.** The Commission may issue negotiated leases if the resource is to be utilized entirely for purposes other than electrical generation; or, if the Commission finds:

Wells drilled upon private or public lands are draining or may drain geothermal resources from State-owned lands;

The lands are determined to be unsuitable for competitive bidding because of such factors as their small size, irregular configuration, or inaccessibility from surface drill sites;

The state owns a fractional interest in the lands; or

The lease is determined by the Commission to be in the best interests of the state.

## **2. California Energy Commission (CEC)**

The CEC has the following role:

**Policy:** To maximize the use of geothermal energy to generate electricity and to promote the use of direct heat.

**Permits:** The CEC reviews and approves the construction of power plants with a capacity to produce more than 50 megawatts (net) or greater.

**Environmental:** The CEC is lead agency for preparation of the EIR for projects they approve. They comment on EIR'S prepared by other agencies as appropriate.

## **3. The California Division of Oil and Gas (CDOG)**

The CDOG is within the State Department of Conservation, and is charged with the responsibility to "exercise its power and jurisdiction to require that wells for the discovery and production of geothermal resources be drilled, operated, maintained and abandoned in such manner as to safeguard life, health, property and the public welfare, and to encourage maximum recovery." (Public Resources Code, Section 3700). CDOG preempts local agency surface regulations which might interfere with state subsurface regulations.

The CDOG has the following role:

**Permits:** CDOG issues permits for a variety of operations pertaining to wells or well sites, including drilling, redrilling, reworking, abandonment, injection well programming, and drill site construction.

**Regulatory:** Supervises all wells on non-federal land during all phases of drilling, operation, maintenance and abandonment.



Environmental: CDOG has delegated its environmental review authority to the County of Imperial for exploratory projects. CDOG also comments on EIR's prepared by the County.

#### **4. Public Utilities Commission (PUC)**

The PUC is concerned with the rate structure of utilities and has no specific policy regarding geothermal energy over other energy sources. It has gone on public record in support of the development of geothermal resources, and has the following role:

Permits: The PUC issues a "Certificate of Public Convenience and Necessity" for the construction of thermal power plants with a capacity to produce more than 50 megawatts (net). The PUC bases the certificate on the economic feasibility of the plant.

Regulatory: The PUC has continuing jurisdiction over the use and operation of power plants certified by it and has jurisdiction over electrical transmission lines designed to operate in excess of 200 kV.

#### **5. State Water Resources Control Board (WRCB)**

The WRCB has no specific policy on geothermal energy, but plays the following role:

Regulatory: At various stages, the State Water Resources Control Board, through the Regional Water Quality Control Board, is responsible for any discharge or action that could adversely effect the surface or ground water of the State. The WRCB grants water right permits for the use of surface waters or subterranean streams.

Environmental: The Board will act as either a Lead Agency or Responsible Agency pursuant to CEQA for all projects which involve the granting of appropriative water right permits and petitions.

#### **6. Regional Water Quality Control Board (RWQCB)**

The RWQCB, Region 7, has the following role in the permitting and regulatory process:

Permits: RWQCB issues permits regulating discharges that could affect water quality. The quality and quantity of any surface discharge of fluid, including the quality and disposal methods of fluids from drilling operations and waste from outside sanitary facilities.

Regulatory: Administers and regulates all water quality matters within its specific geographic area. The RWQCB enforces the standards set by the State WRCB.

Environmental: The RWQCB normally acts as a responsible agency on geothermal projects and reviews and comments on environmental documents. The Regional Water Quality Control Board can also act as the CEQA lead agency for projects involving significant water quality implications.





## **7. The State Department of Fish and Game (DFG)**

The DFG has an interest in geothermal development as follows:

Regulatory: Has authority over watercourse alteration and activities which may affect fish and wildlife and their habitats.

Environmental: Is designated as a trustee agency and therefore comments on the draft EIR prepared by the lead agency.

## **C. Other Local Agencies**

### **1. Imperial County Air Pollution Control District (APCD)**

APCD has discretionary authority as follows:

Permits: The Air Pollution Control District issues two kinds of permits: 1) a "Permit to Construct" based on submission of construction plans showing how emissions are to be controlled; and, 2) a "Permit to Operate" issued following an inspection of the installed facilities.

Regulatory: The APCD sets and enforces regulations for achieving and/or maintaining the air quality standards set by the State Air Resources Board and the U.S. Environmental Protection Agency.

Environmental: Designated as a responsible agency, the APCD must review and approve environmental documents according to its own standards.

### **2. Imperial Irrigation District (IID)**

IID plays an important part in the development of geothermal energy in Imperial County as follows:

Coordination: IID has a positive and cooperative working relationship with the developing geothermal industry providing water, electricity for initial operation, and the "wheeling" of power generated to points outside and within the County.

Permits: The use of IID irrigation water or disposal of water into its drainage system can only be allowed by permit issued by IID.

### **3. Environmental Health Services Division, County Health Department/Local Enforcement Agency (LEA)**

The Environmental Health Services Division of the County Health Department (EHS/Health) plays an important role as the Local Enforcement Agency through the permitting/regulation of designated waste facilities (Class II landfills) that require local and state approval through the issuance of a



"Solid Waste Facilities Permit" for any handling, processing, and disposal of wastes generated by geothermal power plants.

**Authorization:** The California Integrated Waste Management Board has designated EHS/Health as the authorized LEA for issuing a solid waste facilities permit.

**Regulatory:** The LEA determines whether the project conforms to local and state standards, and is responsible to protect public health, safety, and welfare by regulating solid waste facilities.

**Environmental:** The LEA evaluates the environmental impacts of a proposed solid waste facility and any environmental documentation prepared for the process of issuing a solid waste facilities permit.

## **D. Federal Agencies**

### **1. U.S. Department of Interior, Bureau of Land Management (BLM)**

The BLM office in El Centro has jurisdiction over 1.4 million acres of federal land including portions of San Diego County. Federal law preempts any County regulation over geothermal activity on federal lands. Federal lands comprise approximately 50 percent of all lands in Imperial County. Geothermal operations on federal lands are governed by the Geothermal Steam Act of December 24, 1970 (Public Law 91-5810). Surface management of all geothermal activities is provided by the Act and the regulations codified under 43 CFR 3200, and seven Geothermal Resource Operations Orders which were issued by the U.S. Geological Survey.

**Policy:** To provide management of public lands in a ". . . manner which recognizes the nation's needs for domestic source of minerals (e.g. steam). . . protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values." (Federal Land Policy and Management Act of 1976).

The local BLM office has leased thousands of acres of federal land in Imperial County. In the East Mesa KGRA there have been numerous leases granted. Prior to geothermal development on certain federal lands, the BLM prepared an Environmental Impact Statement (1973 EIS) on the use of these lands for geothermal activities under its *California Desert Conservation Area Plan* (1980). This master plan covers approximately 12.3 million acres of land under federal jurisdiction in the California desert area.

Before lease tracts are released for bid and development, an EIS or Environmental Assessment Report (EA or EAR) is prepared. This report more specifically describes potential site-specific environmental concerns and mitigation considerations for the lease tract. The regulations implementing the Geothermal Steam Act also require that an environmental baseline study be conducted and a regular environmental monitoring program must be maintained when operating.





The geothermal developer prepares a proposed Plan of Operations, which must be approved by the district office of the BLM for each phase of geothermal resource investigation and development. There are often multiple "Plans" that require multiple reviews, e.g. "Plan of Utilization", and "Plan of Baseline Data Collection". The plan details the work that will be followed in preparing the well pads, drilling the wells, exploring for a viable steam resource, and utilizing the resource. During the BLM review of the plan, the BLM may consider any state or local ordinances which may be pertinent and require that the geothermal developer's plan comply with them.

Within the County's nine KGRA's, the federal government retains the mineral rights to some lands under the 1916 Stock Raising and Homestead Act. The court has opined that the acquisition of surface rights does not include ownership of the geothermal steam. The right to explore and develop the steam on these lands is thus subject to the same management and controls as that on other federal lands. The BLM has the same responsibilities with lease revenues and steam royalties subject to a 50:50 split between the federal and state governments. As the direct result of Assembly Bill 1905, passed and adopted in 1980, 40 percent of the state's share of the money collected from leases is returned to the county in which the federal lease is located.

The East Mesa KGRA is largely under federal jurisdiction and seven power plants have been permitted. As proposals for power plants are submitted, BLM will focus on the same factors as those considered for development on private and state lands such as:

- Consistency with the Desert Plan, including designated and proposed planning corridors;
- Protection of air quality;
- Impact on adjacent wilderness and sensitive resources;
- Visual quality;
- Fuel sources and delivery systems;
- Cooling-water source(s);
- Waste disposal;
- Seismic hazards; and,
- Regional equity.

## **2. Military Use of County Lands**

The Department of the Navy operates the Naval Air Facility which was established in the mid-1940's. Disposition and leasing of lands for geothermal development falls under the provisions of the Military Construction Act of 1979 which grants each military department the right to use and benefit from geothermal resources.

Range lands, used by the Navy for aerial weapons training activities, are controlled through a number of land use instruments, some of which allow for geothermal development and compatible use where practical. It does not appear that there are commercially viable geothermal fields on lands in West Mesa. There are no federal KGRA's in that area and BLM's study of the area indicates that potential for geothermal development is relatively low.





Due to uncertainties regarding the economic feasibility of developing the Glamis KGRA and the unknown potential of West Mesa, there may not be any significant impacts on U.S. Navy operations in Imperial County due to geothermal development.

### **3. Federal Energy Regulatory Commission (FERC)**

The present FERC PURPA Rule, allows "Qualifying Geothermal Facilities" up to 80 MW, within one mile between facilities. One proposed change would maintain the 80 MW facility rule, but would eliminate the one mile restriction.

The development density of a geothermal anomaly will be naturally limited by the amount of heat that can be delivered from the reservoir to a surface utilization facility. Generally, this is related to surface acreage in the range of one megawatt per 5-40 acres. Expressed another way, one square mile of surface area over a geothermal reservoir may be able to support development of power generation facilities in the range of 16 to 128MW.

Some geothermal anomalies underlie large, non-uniform geographical areas, with diverse surface and mineral ownership. The relaxation of the "one mile" rule would allow plant siting to better accommodate geographical, environmental and property ownership restrictions. This would promote more efficient resource and land use pattern. The natural limitation of geothermal reservoir energy deliverable to the surface, or heat loss, during surface transport will limit the distance the resource can be economically utilized.

Variances from this "one mile" limitation and legislation that would eliminate the 80 MW size limitation for geothermal power plants are currently under consideration.



## APPENDIX D

### GEOHERMAL RESOURCE DEVELOPMENT STRATEGIES

This section provides a generalized view of the different activities which may occur in the search and development of geothermal resources for both power and direct heat uses. There may be many variations and, depending on the success of each previous activity, all or only some of the activities may be conducted at a particular site.

#### **A. Geothermal Resource Exploration and Production**

##### **1. Initial Exploration Phase**

Most of the early studies and activities during this phase are not surface-oriented and have no impact. These studies include literature review, broad geologic studies, aerial photography, and possibly airborne magnetic surveys. Geological mapping provides for an understanding of local geology and may be done by foot or off-road vehicle (ORV). Collections of soil, rock, or water samples from various points in the region may be taken for analysis.

Geochemical studies include water sampling to determine fluid chemistry and temperatures and soil/rock analysis regarding geochemical make-up with age dating analysis if required. These samples are normally collected in small bottles.

If preliminary mapping and soil/rock sampling yield promising results, geophysical surveys are done to attempt to determine information about subsurface temperatures, geologic structures, composition of substratum and other resource data. These surveys can be gravity, magnetic resistivity, magnetotelluric, radiometric, passive seismic or active seismic studies. In each of these survey methods, a number of vehicles and people are needed and temporary access roads may be necessary.

Shallow temperature holes are then drilled to measure thermal gradients. These holes, two to four inches in diameter, are usually no more than 500 feet deep. These are spaced two to five miles apart. Spacing will be reduced as exploration continues. The hole is drilled, a plastic tube is placed in the hole, filled with water, capped and allowed to remain undisturbed for about a week. A temperature device is then used to gather water temperature readings at various depths. Temporary access roads may be needed and a clearing of about 900 square feet is necessary for the drill site. This type of drilling is normally completed in one day by truck-mounted rigs. After measurements are taken, abandonment of these gradient holes is done according to legal requirements.

Observation holes may be drilled for further information about the subsurface geology. These may be as large and deep as the regular production wells described below. Some may be drilled from truck-mounted rigs. These wells are flow tested to assess the reservoir and brine characteristics. Sumps, tanks, and brine handling equipment are installed. One to three acres may be occupied during the drilling and testing period.





Once the preliminary exploration stages are complete, and results encouraging, drilling starts to develop the resource. This involves construction of a road, drill pad, well cellar, and sump. The existing infrastructure of roads in Imperial County is generally adequate, but roads may be improved to carry heavier loads, withstand more constant traffic, and function year-round as necessary. The drill pad area must be leveled and cleared of vegetation large enough to accommodate the drilling rig and accessories, temporary structures, and crew parking. The required space must provide room for service and delivery vehicles. A reserve pit called a "sump", is necessary for waste fluids and drill cuttings with the size of the sump depending on the expected depth of the well. The sump must be designated to provide adequate containment (from 1 to 2-1/2 acre-feet), subject to the requirements of the RWQCB. Large "Baker" tanks are sometimes used instead of a sump.

## **2. Drilling Phase**

After the road, drilling pad, cellar, and sump are completed, a 26-inch to 36-inch hole is drilled with an auger to a depth of 50 to 100 feet and a 20-inch to 30-inch conductor pipe is inserted and cemented to the surface.

The drill rig may stand over 100 feet high and may have a variety of accessories generally assembled together on the site. Accessories may include: mud tanks for mixing and/or storing drilling mud, blowout prevention equipment, compressors, pipe rack for storing pipe sections (usually 30 foot segments), mud pumps, engines of up to 1000 horsepower, facilities for cooling drilling mud during later stages of drilling, fuel tanks, and water tanks. Ancillary equipment used periodically include large cement pumping trucks, and mud hauling trucks. Trailers, office and storage buildings may be located in the immediate vicinity.

Personnel requirements include geologists, supervisors, subcontractors and information loggers. Service personnel include delivery and specialized service personnel and may number 10 to 15. A drilling rig crew can total from 17 to 22 with no more than five to ten on-site at any one time. The total rig work force during drilling can range from 27 to 37 people.

Drilling operations proceed 24 hours per day, seven days a week until the required depth is reached. An estimated 12 to 50 days or more may be required to drill each well, depending on work loads, scheduling, depth of well, and any problems encountered. Well drilling operations, including drilling, casing the well, installation of blowout protection equipment, and tests, and abandonment are regulated and inspected by the California Division of Oil and Gas.

A rotary drilling rig is most commonly used with mud as the circulating medium. Drilling mud removes cuttings from the hole, controls subsurface pressure, cools and lubricates the drill bit and pipe, prevents bore hole walls from caving in, releases drill cuttings at surface, prevents formation damage, provides maximum information from formations penetrated, suspends cuttings when circulation stops, and supports weight of drill string and casing.

During the drilling process, steel casing is cemented into the hole. The casing diameter decreases with depth. Eight inches is a typical completion depth diameter.



Directional holes can be drilled. These holes cost more and take longer than drilling vertically but permit drilling a number of wells from the same well pad. Directional (or "off set") drilling may be used to reach a "down hole" location with no surface access. A well 8,000' deep might be "off set" as much as 5,000'.

A blowout could occur if subsurface pressures exceed pressures produced by the column of fluid in the bore hole. Various types of blowout prevention equipment can be installed to prevent such an occurrence. Blowout prevention equipment is installed at the surface on top of the casing.

Well cleanout is the process of removing the drilling muds, cuttings, and other material from the hole. After the cleanout is complete and the casing has been set, flow testing commences. Flow is directed to the drilling sump through a series of mufflers, and is composed of fluids, steam, and noncondensable gases. The fluids from Imperial Valley wells can include less than 10 to over 30 percent (by weight) of dissolved solids. Noncondensable gases and vapors make up less than three percent of the gaseous volume. If testing produces substances detrimental to the environment, these constituents must be safely detained in the sump or portable tanks. Flow testing may continue for thirty days or more, and may be repeated several times over a number of months. Temperature, fluid flow rates, drawdown, chemistry, etc., are analyzed.

A completed well, not being tested, consists only of the fenced well head, cellar, and piping. It may occupy 200 square feet. Abandonment is the regulated process (by CDOG) of plugging the hole with drilling mud and cement. Upon abandonment, all of the equipment, structures, and related materials are removed and the site is restored.

### **3. Typical Field and Plant Development Phase**

In this phase, the plant is constructed, pipelines are run from each well to the plant, and from the plant to the injection wells. Also at this time electrical transmission lines and poles are constructed as required.

The first step in plant construction is to select the site. The site is more or less fixed by the location of the resource. The typical completed plant site occupies between 12 and 20 acres. During construction another 12 to 15 acres of laydown area for the storage of materials and large vehicle use may be required.

The power plant will consist of office space, parking facilities, tool storage buildings, turbine generator, steam condenser, brine handling equipment, the cooling towers, and flash vessels or heat exchangers. The actual plant size and set up will be determined by which method, flashed-steam or binary, is to be used. If there are noxious gases present that exceed air quality standards, then additional equipment will be necessary to "scrub" these gases from the plant's emissions.

Pipes from well to plant and to injection wells are installed and must be able to expand and contract. This is normally accomplished by installation of horizontal or vertical expansion loops. The size of the network will depend on the number of wells required to power the steam turbine, and the number of injection wells necessary. Each well may have a productive capability of three to five megawatts.





The production and injection well sites and pipe networks may range over an area of hundreds of acres, but will actually occupy only from 16 to 19 surface acres depending on the design of the plant and its layout. Plant and field construction may last two years with approximately 200 or more workers at peak. This will be the period of greatest environmental disruption, similar to a large construction site.

#### **4. Typical Power Plant Production Phase**

During this phase all facilities have been erected; no additional impacts should occur from construction activities. Some noise, noxious gases and toxic elements may be produced but can be mitigated through abatement measures. The production rate of the wells may be less than during the testing phase. During the plant production phase, activities will include the operation and maintenance of the power plant and existing wells, the drilling of new replacement production and injection wells, and waste disposal. Continuing exploration and development can be carried on in other parts of the geothermal field simultaneously with the operational and maintenance activities.

One medium-sized drill rig is needed to drill new wells to maintain generating capacity. As the production gradually diminishes the heat flow from the resource, additional wells must be drilled to allow the plant to operate at full capacity. If brine is to be disposed of by injection, new injection wells will be drilled. The technique and effects of drilling these replacement wells would be the same as for development wells.

Repair, maintenance, and monitoring of the operating field will require use of access roads to service the equipment. Existing wells will require occasional repair work or cleanout. The frequency of remedial work depends upon resource characteristics and production technology. Scaling and corrosion of the equipment from the geothermal brine may require frequent maintenance.

A flashed-steam power plant in Imperial County can be designed to be water self-sufficient. Condensate from the condenser can be used to supply all the water requirements for the power plant cooling towers. However, when the power plant is operating in this mode, about 20 percent of the geothermal brine is lost due to evaporation of the condensate in the cooling towers. Eighty percent of the brine is then available for injection to replenish reservoir fluid and help prevent land subsidence. Other sources of water for cooling tower needs may be available, such as imported water, agricultural wastewater, river water, the Salton Sea, and ground water. Cooling tower water requirements from external sources depend on the temperature of the resource and plant design and may range from 50 acre feet to 100 acre feet per year per megawatt.

During this phase, the disposal of spent fluids become significant simply because of the volume of wastes requiring disposal. Disposal techniques vary, depending on the quality and quantities of waste involved. Normally, injection of the brines and the blowdown is preferred. Solid wastes can also be generated by the plant's operation, and may require disposal at proper waste disposal sites. A project may seek permits for on-site disposal of solid and/or hazardous wastes. Processing facilities may require an additional 3 to 5 acres at the plant site.





Utilizing injection, the brine is injected into non-productive and productive zones of the geothermal field. Typical concerns include whether plugging and scaling problems would prevent the reservoir from accepting the fluid, whether fresh water aquifers can be adequately protected from contamination by hot saline brine, and whether the subsurface rock structure would adequately hold the injected fluids.

It may become economically feasible to extract minerals from the geothermal fluids. Desalinization of brines may also become financially feasible for some areas to provide water for irrigation and other uses.

## **5. Production Closedown Phase**

This would consist of site abandonment and occur when the geothermal resource is depleted to a non-economical level. Geothermal reservoir knowledge has not advanced to a stage where a reasonable economic limit can be predicted, but for planning purposes, a period of at least 30 years is assumed, which in many cases is the steam plant amortization period.

## **6. Plant Closeout and Abandonment**

This includes the removal of all surface facilities, the abandonment or capping of all production and injection wells, and surface restoration to a safe, permanent condition which is as near original condition as feasible.

The Master EIRs in each of the four Geothermal Overlay Zones have more detailed information regarding the above procedures.

## **B. Geothermal Technologies - Flash and Binary Systems**

There are currently two basic energy conversion cycles or systems utilized in Imperial County: flashed-steam and binary fluid cycles.

### **1. Flashed-Steam Conversion Cycle**

Electricity is generated as follows:

Steam is separated from a liquid-steam mixture produced by a geothermal production well or well field;

The separated steam is expanded through a turbine;

The turbine turns a generator which produces electricity;

Steam exhausted from the turbine is condensed by a condenser; and,



The condensate is either sent to an evaporative cooling system (such as a cooling tower) as make-up water or is mixed with the brine and disposed of by injection.

The basic one-stage flash cycle can be modified wherein there are several flash cycles which flash the fluid two or more times and/or a combined flash/binary cycle where, after the flash cycle, the fluid is passed through a heat exchanger (binary) cycle. Below a temperature of 350° F, flash systems generally do not produce adequate steam for economical operations.

## **2. Binary process**

The geothermal fluid is used to vaporize a secondary fluid with a lower boiling temperature than water as follows:

- Geothermal fluid from a production well is passed through a heat exchanger where heat from the brine vaporizes a secondary or working fluid (such as isobutane or propane);

The working vapor drives a turbogenerator which produces electricity;

The vapor is condensed and returns to the heat exchanger in a closed system; and,

After passing through the heat exchanger, all geothermal fluids are injected.

Aside from design differences between the conversion cycles, the amount of fluids extracted for each kwh (kilowatt hour) of electricity produced is primarily a function of resource temperature. More specifically, as the temperature of a geothermal resource rises, the conversion efficiency of a given geothermal power cycle increases, thus reducing the demand.

The cooling tower (or pond) efficiency also increases with resource temperature. The most important consequence of this change in fluid requirements is a reduction in the number of wells and the acre-feet of cooling water needed to support power plants. In other words, the higher the brine temperature, the fewer wells and less cooling water necessary per megawatt generated.

The quantity of fluids disposed also varies inversely with the temperature of geothermal brines. With lower resource temperatures, larger amounts of fluids are needed to operate a power plant, and therefore larger quantities of spent fluids must be injected.

The principal difference or advantage of the binary system is that it allows utilization of moderate temperature resources, and there is no release of noncondensable gases, such as H<sub>2</sub>S to affect air quality. From an air quality perspective, binary would be the preferred technology.

In the Heber "G" Zone, the San Diego Gas & Electric Binary Project (designed at 45 MW net) when it was operating, utilized a working fluid (approximately 90 percent isobutane and 10 percent isopentane) to generate electricity (designed at 65 MW gross). The second Imperial Geothermal Company Binary Project was permitted in Heber at 33 MW (net) in July 1992.





In the East Mesa area, Ormesa in its various plants (Units I, IE, IH, II) utilizes a "modular" unit, known as a Ormat Energy Converter Module (OEC), which includes equipment such as the following: evaporator/preheater, condenser, turbine, generator, motive fluid (pentane) cycle pump, various control safety valves, switches, pressure gauges/controls, internal piping pneumatic lubrication subsystem connections, and power control boards. This Ormat system is based on a subcritical organic Rankine power cycle which produces 3-phase electrical power compatible with the local Imperial Irrigation District grid and all exhaust vapors are subsequently condensed in a water-cooled condenser and recycled to the evaporator by the motive fluid cycle pump. The size of these OEC units is approximately 8' x 8' x 40' in dimension and depending on the size of the facility can be collocated and interconnected to generate the required amount of electricity. The Rankine cycle can reduce parasitic losses and internal pressures within the power plant, meaning a higher equipment reliability, due to lower stresses on the components of these modular units.

### C. Water Production

The 1977 Geothermal Element projected that desalinization of water could occur as a by-product of geothermal electrical production.

Congress passed the Colorado River Basin Project Act, Public Law 90-537 (1968), authorizing the Bureau of Reclamation to study the viability of augmenting the water supply of the Colorado River from sources within the Basin.

The University of California, Riverside, was contracted to perform preliminary geophysical investigations. In the summer of 1972, Mesa 6-1 was drilled to 8,015 feet in the East Mesa KGRA. The fluid temperature was 330° F and had a flow rate of about 100 gallons per minute with about 20,000 parts per million of total dissolved solids.

On June 3, 1974, the Bureau of Reclamation awarded a contract to Bechtel Corporation to determine heat transfer, scaling, corrosion, fluid chemistry, and flow characteristics. Systems were employed at East Mesa by the Bureau of Reclamation and Bechtel that are used worldwide for the recovery of potable water from seawater. These systems were the multistage flash and the vertical evaporator designs. The operators concluded:

" . . . at least 75 percent of the water content of the geothermal brine entering the plant can be recovered, utilizing the energy of the geothermal brine as a source of heat for the distillation plant. . . " and that, " . . . Recovery of water from geothermal brine is technically feasible through the use of either the multistage flash evaporator concept, or the vertical tube evaporator. . . "

The Bureau of Reclamation estimated in 1972 that as much as 2.5 million acre-feet a year of desalinated water could be produced from geothermal resources in Imperial County. Their 1979 *Geothermal Resources Investigations East Mesa Test Site - Concluding Report*, found (largely due to reservoir transmissivity limitations) this to be an unreasonably optimistic estimate. On an economic basis, they could not support water production.



H.J. Vaux, Jr., of the University of California, Riverside, prepared a cost analysis for producing fresh water from geothermal resources by a desalinization plant. He estimated that desalinization would cost about \$.45 per 1000 gallons, or \$145 per acre-foot.

There does not appear to have been any notable changes in the desalinization technology since these studies were completed, but a rough estimate of cost in 1984, considering inflation and interest rates, might be closer to \$1000 per acre-foot. A number of Southern California communities are paying up to \$200 per acre-foot. The Imperial Irrigation District currently delivers water to local industrial users for \$58.00 per acre-foot and to agricultural, municipal, and miscellaneous users at \$11.60 per acre-foot. For comparison, the estimated costs for ocean water distillation ranges between \$1,200 and \$1,500 per acre foot depending on the desalinization process utilized (San Diego County Water Authority, 1990).

#### **D. Direct Heat Uses**

In addition to electrical generation, geothermal resources can be utilized in nearly any process or activity which requires heat. Geothermal fluids can be used directly from a well, or users could obtain "cascaded" heat from other projects.

The potential for direct use in Imperial County remains to be seen. The long-term availability of geothermal resources could serve as a catalyst for local economic development. A study sponsored by the U.S. Department of Energy and the County (May 1983) evaluated potential uses of direct heat in five major categories:

1. **Agriculture:** Geothermal energy could be used by farmers, stockmen, ranchers or consortiums of the above; projects could include crop refrigeration and greenhouse and feedlot operations.
2. **Aquaculture:** Warm waters can be utilized to grow certain aquatic species, e.g. catfish, prawns, algae, tilapia and for the hydroponic growing of vegetables.
3. **Food Processing:** Opportunities for processing of food include refining and cold packing, vegetable canning, dehydration and freeze-dry operations.
4. **Ethanol Process:** Imperial County could be a prime location for geothermally-produced ethanol due to the combination of a local supply of feedstock, the geothermal energy resource, and nearby metropolitan markets.
5. **Manufacturing:** Certain industrial and manufacturing applications could use geothermal energy to replace fossil fuel and electricity, e.g. process heat, refrigeration and motive steam.

Since the temperature requirements are generally lower for direct heat projects, more flexibility in location of direct heat projects may be possible. However, in order to minimize the cost of fluid transmission, project locations must be near the geothermal resource.





The growth of geothermal direct use projects continues to be unpredictable at present, since development will be influenced by a number of factors including prices for competing energy sources, labor costs, price of land, and tax incentives, among others. Development of resources for electricity generation could facilitate development of direct applications. Resolution of technical issues and the availability of cascaded heat from power plants may lead to development of direct heat projects. A successful local application of geothermal resources for an industrial project could stimulate development of other projects.

The geothermal aspects of proposed industrial projects are expected to be relatively minor in comparison with the non-geothermal aspects of the projects, i.e. capital costs, operating costs and environmental impacts.

The non-geothermal issues of economic development and industrial projects are analyzed in other portions of the County General Plan.

### **E. Mineral and Gas Extraction**

In various parts of the world, brine has been used to produce minerals. However, the recovery of these minerals from geothermal brine is dependent upon both production costs and market price.

In certain KGRA's, particularly the Salton Sea, the brine is very high in minerals such as sodium, arsenic, antimony, mercury, selenium, potassium, iron, tin, manganese, chlorine, boron, bromine, potash, and zinc, among others. Precious metals--silver, gold and platinum--are present in trace concentrations. Studies of brine in the Salton Sea area have shown substantial differences in the trace element compositions even from relatively close-space wells. The total dissolved solids and mineral concentrations in the brine can also change with the well flow rate.

Both the U.S. Bureau of Mines and the Department of Energy have sponsored experimental programs on mineral extraction from Salton Sea brines. However, few detailed reports are available. In 1974, the Bureau of Mines funded research to do a study at the Salton Sea. Hazen Research built and operated a 15 gallon per minute pilot plant which was operated successfully. The process was based on selective precipitation of the hydroxides found in the brine utilizing lime.

Another study was performed by SRI International at the San Diego Gas and Electric Geothermal Loop Experimental Facility (GLEF). This study involved precipitation of the more valuable elements in the brine through use of a sulfide. A number of equilibrium calculations were made using aged, spent brine from the GLEF. SRI's goal was to precipitate all of the silver, lead, and zinc, while minimizing the precipitation of iron and manganese and using as little of the sulfide as possible. After a careful study and analysis for silver in the brines, they concluded that the silver content of the brine used was 0.02 parts per million utilizing Magmamax #1 brine.

Although the potential for mineral extraction exists, processing methods are still under development. Since the geothermal brines of the Salton Sea KGRA have a greater concentration of valuable minerals, future process design studies will probably focus on this area's resource. Currently, it





appears the flashed-steam technical design has the greatest potential for mineral recovery in the Salton Sea area.

Some of the minerals that could be extracted from geothermal brines are of strategic value to our national defense. Manganese and tin are only two of these metals which may become difficult to import if world conditions control availability. Table D-1 lists the percentage of metals of strategic value to the United States which are imported from various countries and which could be extracted from geothermal brines. Table D-2 gives typical Imperial Valley brine chemistry.

Early extraction of gas occurred in the Niland area from 1933 to 1954 where a large amount of carbon dioxide was produced to make dry ice. The flow of geothermal brine also releases methane, hydrogen sulfide, radon, benzene, and mercury gases in small quantities. With adequate abatement methods, these gases are not hazardous.

**TABLE D-1**  
**STRATEGIC METALS VITAL TO DEFENSE AND ECONOMY**

<b>Metal</b>	<b>Uses</b>	<b>Percent Imported</b>	<b>Principal Sources</b>
Chromium	Stainless steels, electroplates	90	South Africa, C.I.S.
Cobalt	Superalloys, magnets	90	Zaire, Zambia
Manganese	Steels and steel-making	98	Gabon, South Africa
Platinum Metals	Catalysts, glass-making, electronic contacts	89	South Africa, C.I.S.
Tantalum	Capacitors, superalloys, cutting tools	96	Thailand, Malaysia
Tin	Tin plate, bearings, solder	81	Thailand, Malaysia

Source: Lawrence Livermore Laboratories



**TABLE D-2**  
**TYPICAL IMPERIAL VALLEY BRINE CHEMISTRY**

Dissolved Solids (in mg/l)		Salton Sea	Westmorland	Brawley	Heber	East Mesa
Sodium	NA	52,000.	10,000.	22,000.	4,200.	2,600.
Potassium	K	14,000.	1,400.	3,800.	260.	190.
Calcium	Ca	24,000.	690.	8,100.	880.	130.
Magnesium	Mg	106.	188.	34.	5.4	3.4
Chloride	Cl	145,000.	18,000.	46,000.	7,900.	3,900.
Sulfate	SO <sup>4</sup>	84.	57.	----	99.	155.
Bicarbonate	HCO <sup>3</sup>	140.	2,900.	49.	27.	490.
Arsenic	As	11.	----	2.6	0.1	.16
Boron	B	350.	63.	140.0	14.	5.4
Barium	Ba	433.	----	363.	3.8	2.2
Copper	Cu	4.	.07	.11	.53	.03
Fluoride	F	9.	2.24	----	1.6	2.0
Iron	Fe	2,300.	.3	65.	22.	2.2
Lithium	Li	211.	48.	100.	9.5	6.3
Manganese	Mn	1,200.	2.8	190.	2.7	.42
Nickel	Ni	4.	----	----	----	.03
Lead	Pb	100.	3.8	1.1	1.9	.09
Strontium	Sr	500.	----	340.	53.	38.
Zinc	Zn	660.	.04	14.	.83	.07

Noncondensable Gases (in mg/kg)		Salton Sea		East Mesa	
		Range	Mean	Range	Mean
Hydrogen Sulfide	H <sup>2</sup> S	1.6 - 6.0	3.2	0.12 - 1.6	0.54
Ammonia	NH	20 - 40	35	1.3 - 8.1	4.5
Carbon Dioxide	CO <sup>4</sup>	1,100 - 3,800	1,700	270 - 2,300	1,100
Methane	CO <sup>4</sup>	3 - 10	6.0	4.0 - 56	33
Hydrogen	H <sup>2</sup>	0.0016 - 0.002	0.0018	0.005 - 0.007	0.0064
Source: Pimental et al. 1978, Ermak et al. 1979.					





## **F. Solid Waste Disposal**

Geothermal energy production may create large volumes of waste, some of which contains heavy metals, naturally occurring radioactive materials (NORMS), and salts. Wastes also result from well drilling and testing, and power plant operation. Wastes can include rotary drilling muds, workover and clean out fluids, well testing fluids, geothermal brines and residues, pretreatment sludge from cooling water makeup, and cooling tower and boiler blowdown sludges.

An occasional waste is fill-packs at cooling towers of some geothermal plants. Generally the fill-pack is a Class III waste, but can become a Class I waste due to its copper content from sludge and film build-up. Another common waste generated is the desiccant used to keep moisture out of specified compressor lubricants. Generation of Class I, Class II, and Class III wastes (particularly those having special health risks) are reviewed during the County permit process and a mitigation monitoring program is prepared to reduce potential health risks to project-employees and the public.

The regulation of geothermal solids depends on the area where the solids originate. The East Mesa Power Plants are permitted by the Bureau of Land Management which would handle disposal issues in conjunction with Regional Water Quality Control Board. In the Salton Sea and Heber areas, the County Department of Public Works, Planning Department and the Regional Water Quality Control Board (RWQCB), would review and monitor the disposal/storage of geothermal solids in appropriate landfills. Some clean-up efforts in various parts of Imperial County are within the Regional Water Quality Control Board's jurisdiction.

The RWQCB requires that geothermal wastes which contain in excess of 6,000 parts per million (ppm) total dissolved solids, be disposed of in a Class I landfill, and those wastes with less dissolved solids may go to certain Class II sites. Five sites in Imperial County are authorized for the acceptance of geothermal wastes: Laidlaw Environmental Services/GSX site accepts hazardous and non-hazardous geothermal wastes, and the County-operated landfills located in Brawley, Calexico, Holtville, and Salton City may accept non-hazardous geothermal wastes.

Desert Valley Company's Class II "Monofill" is permitted to store and dispose of geothermal solids only from Magma Power Company's four existing geothermal plants in the Salton Sea area. Desert Valley Company also owns two contiguous sections of land which are to be developed in two Phases: Phase I consists of one "monofill" of approximately 7 acres with a capacity of 300,000 cubic yards; and Phase II is anticipated to have the same capacity and be constructed within the year 1996.

The County's Integrated Waste Management Plan (COIWMP) is to be prepared by the County Department of Public Works, and adopted by the Board of Supervisors and the cities. The COIWMP addresses the need for disposal sites to receive appropriate geothermal wastes. All waste management activities in the County must comply with the COIWMP as adopted and/or amended.

## **G. Transmission Corridors**

The development of energy pursuant to this plan will require an improved electrical transmission system. It is the policy of Imperial County:



- To recognize the necessity for transmission corridors within and through Imperial County;
- To plan for the least disruptive corridor routing; and
- To formalize the County's input to the appropriate public and private entities in terms of goals, policies, routing criteria and specific corridor location plans.

The following goals are established and adopted for these policies:

- To protect the health and safety of Imperial County's residents and their communities by assuring that the corridors will be so located as to have the least possible adverse impact upon them.
- To protect the health and well-being of Imperial County's agricultural economy by assuring that the placement of transmission towers and lines will have the least possible adverse impact on agriculture to the extent practicable.
- To protect, as much as possible, the fragile ecological balance of our wetlands and surrounding desert by assuring that natural resources will be considered in the location of transmission corridors.
- To utilize, wherever possible, existing rights of way (such as existing lines, roads, canals and railroads) for the placement of transmission towers and lines so as not to further impact our surrounding environment.
- To minimize, as much as possible, the impact of transmission towers and lines upon our aesthetic environment by encouraging appropriate location and design features.
- To participate in State and Federal licensing procedures for the location of transmission lines, towers and related substations where it is deemed that such participation would serve the best interests of the County.

The following guidelines will be followed regarding transmission routes, except where competent and responsible advice dictates otherwise.

- Transmission rights-of-way, including the towers and lines, be located adjacent to existing roads, canals and property lines. Towers should be sited at the end of fields wherever possible.
- Diagonal alignments of transmission lines and towers through agricultural fields should be avoided.
- The use of H-frame transmission towers or mono poles should be considered in the agricultural area where their placement would minimize the removal of land from production and facilitate the operation of farm equipment.





- When the need arises for a second transmission line, it should be placed within the same right-of-way as the first line, parallel to and alongside existing towers, in order to avoid the staggering of tower placement and further impacts to agricultural activities.
- All transmission towers near airports or crop duster strips shall comply with FAA regulations.
- The operating entity shall provide grounding of stationary structures where necessary in order to minimize the build-up of electrical charge and protect avian species.
- Questions concerning payments for rights-of-way, liability in the event of damage to transmission structures, and weed clearance at the tower footings are subject to negotiation between the utility company and the land owners.

Due to the direct impacts geothermal development has on existing and future transmission lines in Imperial County, it is necessary to consult with the Imperial Irrigation District. The District's position is that it owns and operates all transmission lines within its service area. The current exception to this is the 500-kV transmission line, Southwest Powerlink, through the Valley; however, the District is part owner of this facility as well as the Imperial Valley Substation.

The IID and the geothermal developers have worked jointly in the building of the 230-kV line running from the East Mesa area north to the Southern California Edison system.

The following maps are included to provide a general overview of the designated transmission line corridors in Imperial County for geothermal development. The map on Figure D-1 outlines the various switchyard areas for the geothermal collector system and proposed interconnection point for the northern corridor. It also depicts the location of the 230-kV and 500-kV transmission lines in relation to the geothermal collector system.

The map on Figure D-2 indicates the four federal planning corridors (J, L, M and N), the CFE-SDG&E 500-kV 230 kV line from the La Rosita Substation in Mexico to the Imperial Valley Substation, the geothermal 230-kV line, and the SDG&E 500-kV line stretching from the Arizona border to the San Diego County line. The environmental impacts associated with transmission lines have been addressed in the Final Environmental Impact Report (March 1980) prepared and adopted by the County Board of Supervisors.






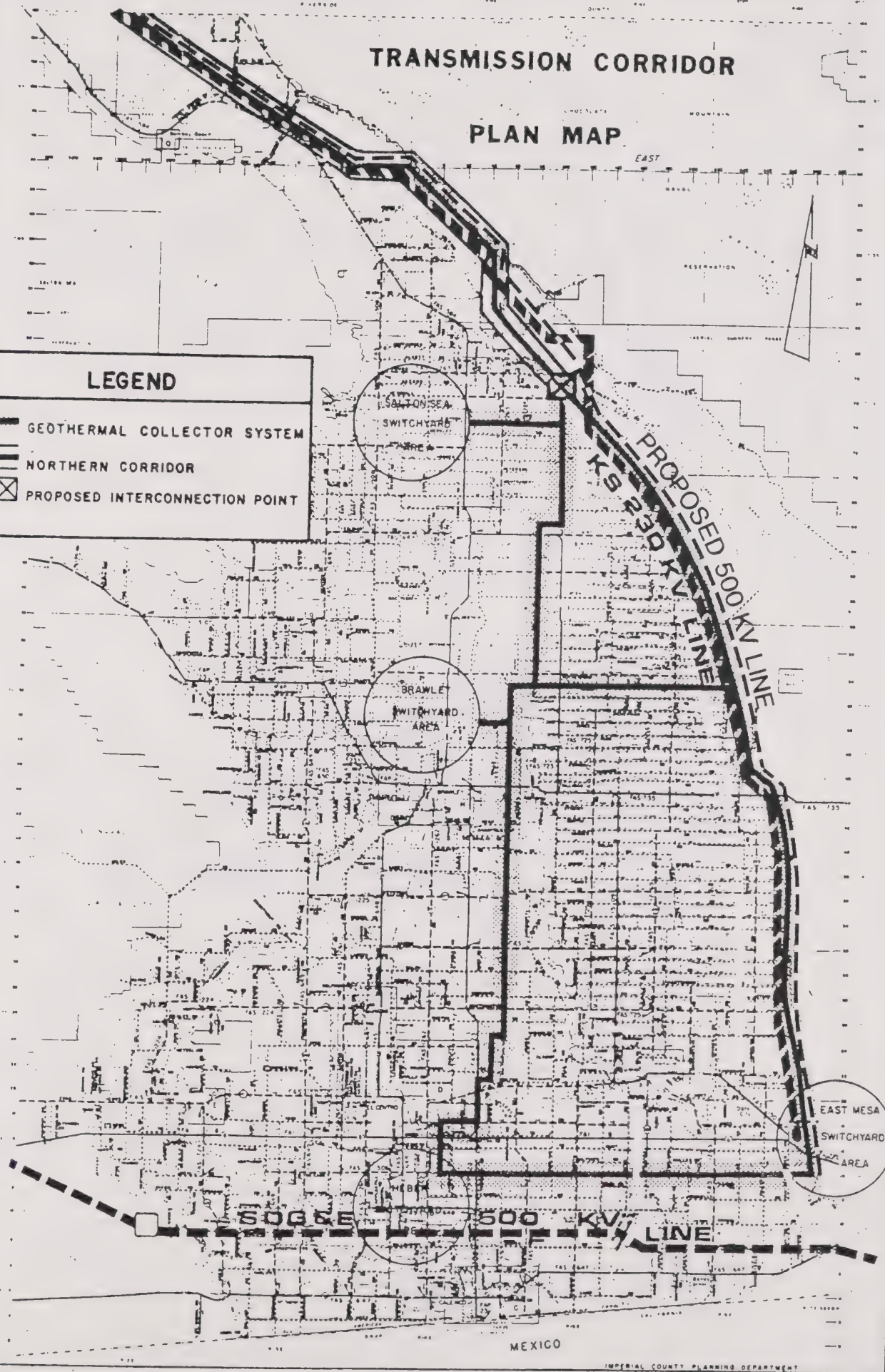


# TRANSMISSION CORRIDOR

## PLAN MAP

### LEGEND

-  GEOTHERMAL COLLECTOR SYSTEM
-  NORTHERN CORRIDOR
-  PROPOSED INTERCONNECTION POINT

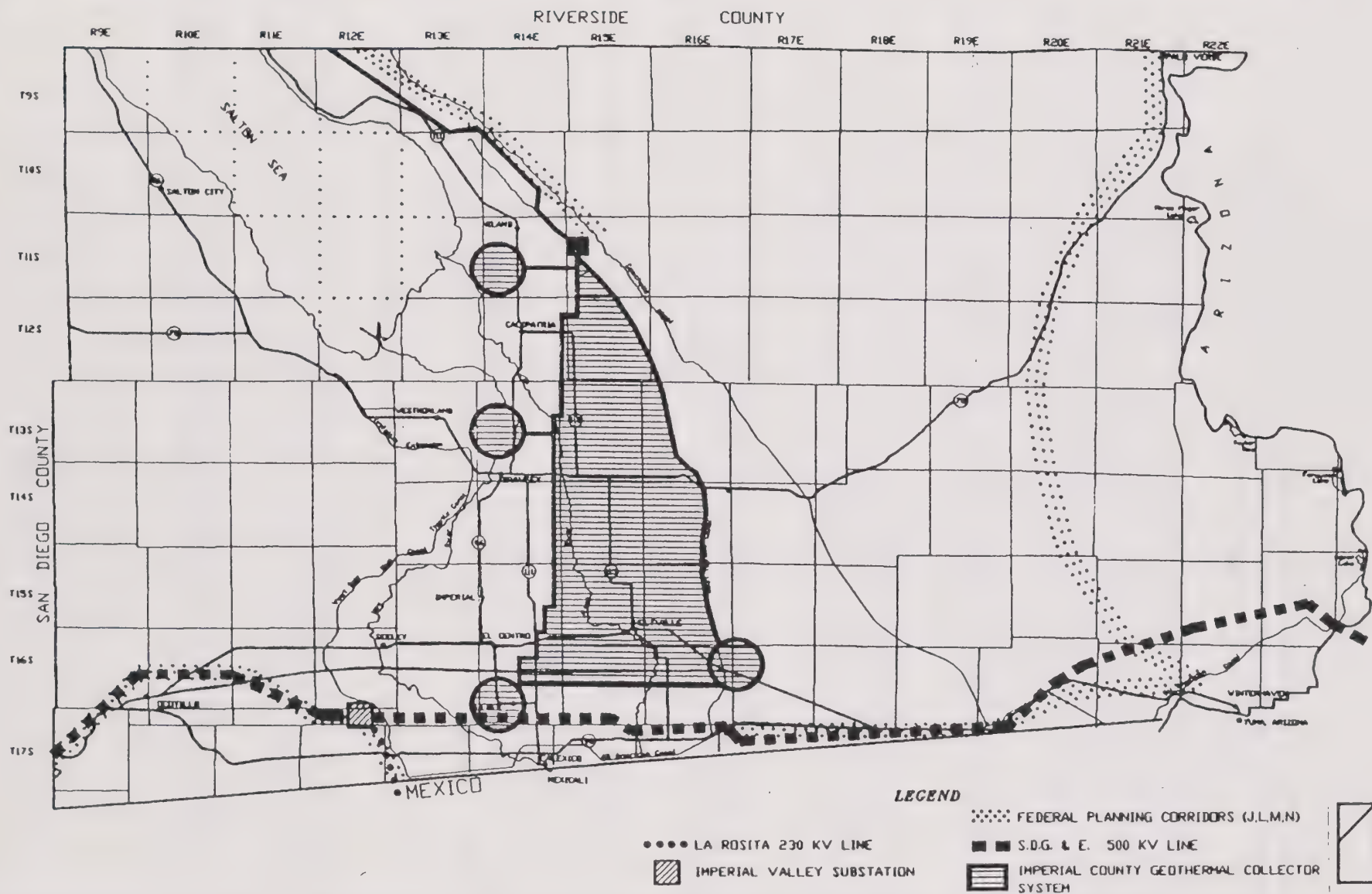


IMPERIAL COUNTY PLANNING DEPARTMENT  
4-12-84  
5-5-90 C7M

Figure D-1



MAP NO. 4



Imperial County  
General Plan

Federal Transmission Planning Corridors

Geothermal and Transmission Element

Figure  
D-2





- Estimated number of years remaining in the life of the field; increases in annual assessment are subject to Proposition 13 limitations. However, an increase in the number of years remaining could be enrolled as "new property".

In addition to the taxes levied on the resource, also subject to tax assessment are land, power plant, transmission lines, and other facilities. When owned by a public utility, these facilities are assessed by the State Board of Equalization. The Board uses a unitary value concept to determine the fair market value of the land and improvements owned by the public utility in the state. The following factors are used by the Board to determine fair market value: Original/historical cost of land and improvements less depreciation; capitalized earnings; and market value of stock and debt issues.

The Board determines annually the fair market value of all the assessee's taxable property and then allocates this value to the County tax areas where the property is located.

The fifteen operating plants in Imperial County are assessed by the Imperial County Assessor's Office. This amounts to over \$1.2 billion of assessed value of local geothermal fields, plants, and equipment, bringing approximately \$12 million annually into the County Treasury for disbursement to various local taxing agencies.

A typical 50 megawatt plant and associated resource development is estimated at approximately \$150 million dollars. Due to the SBE's method of determining fair market value and allocating assessed value of the state-assessed property, the exact amount of Imperial County's share is unpredictable. The SBE staff indicates that the above figure could be significantly less.

#### **B. Fiscal benefit of sales tax revenues from purchase of goods and services**

Retail sales and resultant sales tax revenues will increase temporarily during peak construction phases. Geothermal service industries, cascaded heat users, and direct heat industries will also be established bringing additional demands upon local business for goods and services. A portion of sales tax revenues generated locally by geothermal development will be returned to Imperial County by the State Board of Equalization.

#### **C. Royalty and lease benefits to local landowners**

Local landowners profit from the development of the geothermal resource in three major ways: Annual rental payments for leased land; monthly royalty payments for a percent of gross or net production; and payments for any surface use of land (such as for pipelines and well pads).

Increased revenues to local landowners can provide local benefits through increased expenditures and investments. A secondary benefit to local landowners would be improvements to adjacent roads.



#### **D. Social and fiscal benefits from increased economic activity and employment**

Based on estimates and experience, a 50 MW plant and related facilities could require the following workforce:

Site preparation/drilling	45 workers/average for 9 months
Construction (structure/equipment)	70 to 180+ for minimum 18 months
Operation & Maintenance (once construction is complete)	35 workers (more or less depending on design of plant)

In 1992, the 482 geothermal industry employees in the County represented an annual payroll of about \$12.5 million. Of the local work force who operate and maintain the various electrical plants, the vast majority are local residents. The non-local labor force estimated to be needed would increase local retail sales through purchases of food, lodging, gasoline, car maintenance, medicine, entertainment, drugstore items, and laundry services. It is assumed that on weekends and scheduled days off, the non-resident work force would return home.

Direct heat employment opportunities are not included in the above analysis. Recent estimates indicate that employment could range from 6 to 75 persons per project in the related industries such as crop cooling/packing, vegetable dehydration, food processing, greenhouses, and aquaculture.

New geothermal-related jobs will not be seasonal, so the development of geothermal energy could help to stabilize the County's economy.

Local statistics continue to indicate that young adults now tend to leave the County shortly after high school. This emigration might be reduced if geothermal development offers a variety of jobs for those wishing to remain in the County. The employment generated will also produce jobs in other sectors of the local economy, utilize a greater range of job skills, and provide new employment opportunities for local unemployed residents.



## APPENDIX E

BENEFITS OF GEOTHERMAL DEVELOPMENT

The benefits of geothermal development in Imperial County are:

- Fiscal benefit of expanded property tax revenues.
- Fiscal benefit of sales tax revenues from purchase of goods and services.
- Royalty and lease benefits to local landowners and County.
- Social and fiscal benefits from increased economic activity and employment opportunities.

**A. Fiscal benefit of expanded property tax revenues**

The property tax effects from development of the resource would result in major increases in property tax revenues. Property taxes are levied on both the geothermal resource and the power plant. Property taxes related to the geothermal resource will be assessed by the County. While public utility facilities will be assessed by the State Board of Equalization (SBE).

Property taxes on geothermal-related activities will be affected by Proposition 13, Article XIII A of the California Constitution. Under Article XIII A, property taxes are limited to 1.0% of the full cash value of the property. In addition to this limitation, increases in county-assessed valuation of real property are limited to 2.0% per year, unless there is a change in ownership of the property. This limitation applies to land, including geothermal resources and improvements including any county-assessed power plant. The 1.0% tax rate also applies to state-assessed property, but the limitation on assessed value does not.

Geothermal resources are assessed locally and have two methods of taxation:

1. If the resource area is not in production, the assessment is based on the capitalized net present value of the rental payments made by the lessee, but increases in value are limited as described previously.
2. Once production commences and geothermal brine is being sold, the method of taxation changes to an "appraised income" approach or the capitalized present value of the future net income derived from the resource. To calculate the property tax assessment under this method, the following data is necessary:
  - The capitalization rate;
  - Net income from operations; and





## **APPENDIX F**

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**H2O**

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water element

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## **IMPERIAL COUNTY GENERAL PLAN WATER ELEMENT**

### **I. INTRODUCTION**

#### **A. Preface**

For many years there has been a growing concern about water resources and environmental problems. Allocating water resources, achieving improved water quality and conserving water are very critical issues in the Imperial County. Although new technologies can be useful, solutions to such problems require a broader view combining technical approaches with economic considerations.

The Water Element is a newly drafted non-mandated Element of the County General Plan. It contains information regarding general goals, objectives and policies to help Imperial County conserve and utilize this valuable resource. In addition, an assessment of the water resources and patterns of water use are presented. These features of the Water Element are aimed at guiding the County of Imperial to encourage efficient water use and provide sufficient water demands for long-term availability. The Water Element serves as a benchmark for water management planning and in assisting the decision-making process on various land use issues within the County.

Imperial County has been known for many years as a mecca of raw resources. The County is committed to continue to supply these raw resources in hope of exploring additional available resources and to further diversify its agriculture and manufacturing production capabilities. Through this Water Element, and combined efforts with Federal, State and Local agencies, Imperial County will continue to enhance and utilize its water resources to accommodate future growth and establish a strong economy.

An awareness of the importance of a sound Water Element is important in recognizing that water in California is becoming a scarce resource. Land use decisions based in part upon water resources have significant effects on the physical, social, and economic character of the county. Although the Water Element is concerned with long range goals and objectives, attention should also be given to currently existing conditions and issues. This approach will enable the County of Imperial to face important issues today, thereby avoiding problems in the future.

#### **B. Purpose of the Water Element**

The purpose of this document is to identify and analyze the types of water resources within Imperial County and to assure that goals and policies are adopted that preserve and enhance resource availability and quality. It has been prepared to assure that water resources are conserved and utilized to enhance long-term availability, while providing for current supplies and demands. In addition, this document has been prepared to improve the use and distribution





of water in Imperial County, including the extension of current water conservation programs. Through this document the County provides leadership, information and advisory services to help users increase efficiencies in their water consumption within the county.

California Government Code, Section 65300, requires all cities and counties in the state to prepare and adopt comprehensive, long-term general plans and update each of the elements which direct the development of the community. As an official document of the County of Imperial, the Water Element provides goals, objectives and policies to guide the development, utilization and preservation of water resources in the County.

In addition to the statement of goals, objectives and policies, the Water Element includes discussions, data, and water conservation programs which provide for the prudent and conscientious management and utilization of water resources for future development in the County.

The implementation of the Water Element is meant to assure that water resources are conserved and utilized as possible, and to provide for the long-term viability and availability of this precious resource. The goals and objectives of the Water Element of the Imperial County General Plan are designed to help the County play an important role in the management of future water demands due to future expansion of urban and non-urban developments.



## **II. EXISTING CONDITIONS AND TRENDS**

### **A. Preface**

The geographic center of the Imperial Valley is one of the finest agricultural areas in the world, in spite of the fact that it is in a very arid region. The general area of the Imperial Valley, better known as the Imperial Unit, is bounded on the north by the south shore of the Salton Sea, on the south by the All-American Canal, on the east by the East Highline Canal, and on the west by the Westside Main Canal.

The causes of the agricultural success of this region are two-fold: the rich soils which have accumulated on the valley floor over thousands of years; and the large quantity of water that is transported from many miles east via the All-American Canal, and subsequently distributed to farmlands by a complex system of smaller canals.

A significant geographical feature in the County is the Salton Trough, which contains the Salton Sea and the Imperial Valley, and has been evolving for millions of years. It is a "rift" in the earth's crustal plates. The East Pacific Rise is the boundary between the Pacific and North American Plates. It extends up the Gulf of California by a series of "spreading centers" with strike slip faults. The thinning of the crust from the slow but continuous widening of the Salton Trough causes the earth's magma to rise closer to the surface and generates abnormally high heat flow, which in turn heats deep ground waters.

The trough is a structural extension of the Gulf of California. In prehistoric times it contained the ancient Lake Cahuilla (not to be confused with the present Lake Cahuilla which is located at the terminus of the Coachella Branch of the All-American Canal).

The Imperial Valley was created when the Colorado River formed a delta that isolated the Salton Trough from the Gulf of California. Subsequently, under desert conditions, the inland sea dried up. Later, the trough was occupied by lakes for various periods, and deposition into these lakes gave the valley its characteristic flat lands and fertile soils.

Further background information on prehistoric and historic water use and development in Imperial Valley is provided in Appendix A.

### **B. Existing Conditions**

#### **1. Water Rights**

The water of the Colorado River is used by both the Upper Basin States (Colorado, New Mexico, Utah, Wyoming) and the Lower Basin States (Arizona, California, and Nevada), as well as by Mexico. In accordance with the Colorado River Compact of 1922, the Upper and Lower Basin States are each entitled to the exclusive beneficial consumptive use of 7.5 million acre-feet (MAF) of Colorado River water each year, in perpetuity. In addition, an option is granted to





the Lower Basin States for the use of an additional 1.0 MAF for beneficial consumptive use. The 1929 California Limitation Act limits California's annual consumptive usage to 4.4 MAF, plus not more than one-half of any excess or surplus water unapportioned by the Compact.

By treaty signed on February 3, 1944, Mexico is entitled to 1.5 MAF of the Colorado River water each year. In years of low flow, any shortfall required to meet Mexican treaty rights will be made in equal quantities by the Upper and Lower Basin States. This treaty takes precedence over the Colorado River Compact of 1922.

In 1928, The Boulder Canyon Project Act was passed by Congress which authorized the construction of Hoover Dam and Power Plant and the All-American Canal to Imperial and Coachella valleys. The Act also required that the District and other water users to enter into water delivery contracts with the Secretary of Interior. Finally, the Act authorized lower basin states to enter into a water apportionment agreement. The proposal was as follows: of the 7.5 MAF of water annually apportioned to the states, Nevada would receive 0.3 MAF, Arizona would receive 2.8 MAF, plus one-half of any excess water unapportioned by the Colorado River Compact, and California would receive 4.4 MAF, plus one-half of any excess water unapportioned by the Colorado River Compact.

The proposed apportionment was never settled upon by the Lower Basin States. In 1964, the United States Supreme Court Case of *Arizona v. California* (373 U.S. at 546) concluded that an agreement was not necessary because the Project Act authorized the Secretary of Interior to deliver water in accordance with the apportionment.

To complete the apportionment in California, the Secretary of Interior requested the State of California to prioritize water rights among the major water users. There were seven major water users which included the Palo Verde Irrigation District, the Yuma Project, the Imperial Irrigation District, the Coachella Valley Water District, the Metropolitan Water District, the City of San Diego, and the County of San Diego. On August 18 of 1931 the California Seven Party Agreement was signed by all the water users and went into effect. Table 1 shows the water apportionment priorities. Note: that the first four California priorities total 4.4 MAF annually, of which the agricultural agencies are entitled to 3.85 MAF. As a result of the Colorado River Basin Project Act of September 30, 1968, the 4.4 MAF are also the quantities accorded priority over the Central Arizona Project.

After the California Seven Party Agreement, a draft contract for water delivery was submitted to the District by the Secretary of Interior. The draft contract called for extension of boundaries of the Imperial Irrigation District to include the Coachella Valley. The Coachella Valley desired to maintain its own organization.

The District and the Secretary of Interior negotiated another contract which was approved by the District and the voters. Following approval, the District filed an action in the Supreme Court to validate the contract. The Coachella Valley objected to the validation. Following judgement in favor of the District and during Coachella Valleys period of appeals, Imperial Valley and



**TABLE 1**  
**PRIORITY ESTABLISHED BY THE**  
**SEVEN PARTY AGREEMENT FOR WATER APPORTIONMENT**

Priority/User	Apportionment
1. Palo Verde Irrigation District (For use exclusively upon 104,500 acres of valley land in and adjoining district)	
2. Yuma Project (For use on California Division, not exceeding 25,000 acres of land)	
3a. Imperial Irrigation District and Coachella Valley Water District (Lands served by All-American Canal in Imperial and Coachella Valleys)	3.85 MAF
3b. Palo Verde Irrigation District (For use exclusively on an additional 16,000 acres of mesa lands)	
4. Metropolitan Water District (For use on Southern California Coastal Plain)	0.55 MAF
5a. Metropolitan Water District (For use on Southern California Coastal Plain)	0.55 MAF
5b. City and County of San Diego <sup>1</sup>	0.112 MAF
6a. Imperial Irrigation District and Coachella Valley Water District	0.3 MAF
6b. Palo Verde Irrigation District (For 16,000 acres of mesa lands)	
<b>Total within California</b>	<b>5.362 MAF</b>
<sup>1</sup> Apportionment merged with those of MWD in 1946.	
<sup>2</sup> Quantity is the Basic Entitlement for California.	
Source: Water Conservation Plan, Imperial Irrigation District, 1985.	





Coachella Valley negotiated in what came to be the Compromise Agreement of 1934. The result of this Agreement was that the District would have priority over Coachella in times of water shortage.

## **2. Surface Water Quality**

The surface waters of the Imperial Valley are quite different from what would be expected in a natural desert climate. The existence of most surface waters in the area is dependent primarily upon the inflow of irrigation water from the Colorado River via the All-American Canal. The use of this water for irrigation and other purposes has a significant effect on the quality of surface water.

There are three general categories which describe the surface water in Imperial County. These are freshwater, brackish water, and saline water. The freshwater (with TDS generally less than 1,000 ppm) include the All-American Canal and other canals and laterals which deliver irrigation water to the agricultural fields within the County. The brackish waters (with TDS in the range of 2,000 to 4,000 ppm) include the Alamo River, New river and the agricultural drains that flow into these rivers or directly into the Salton Sea.

The Salton Sea represents the saline water category. Salinity concentrations are currently slightly higher than ocean water (the Salton Sea's current TDS is approximately 44,000 ppm). The surface waters in Imperial County thus pass through a salinity gradient from the Colorado River to the Salton Sea.

This regional salinity gradient exists because of the high evaporation of the Imperial Valley, high temperatures, low annual rainfall, and continual leaching of salts from irrigated areas. Evapotranspiration is water transported and evaporated from plants and surrounding soil surfaces. Although water is continually evaporated from the major canals, this evaporation represents a relatively minor increase in dissolved solids concentration because of the short residence times within the water conveyance system.

High evaporation rates from the irrigated fields substantially reduce the amount of water and increase the concentration of salt entering the drainage system. A 300% to 500% increase in total dissolved solids concentration is normal within the valley as water moves from the All-American Canal to the New and Alamo Rivers.

The change in salinity through the valley is extremely important because it affects the aquatic ecosystems and other beneficial uses of the surface waters. However, salinity is not the only water quality issue. The intensive irrigation in the valley presents the potential for the introduction of agricultural chemicals, such as pesticides and herbicides, into downstream waters. Field erosion and dredging activities also result in siltation in the New and Alamo Rivers and the Salton Sea. The bacteriological quality of these waters is also a concern because these streams receive locally generated municipal waste discharges, in addition to the waste load entering the United States from Mexico.





Additional information on surface water quality is provided in Appendix B.

### 3. Groundwater Quality

The shallow aquifers beneath the Imperial Valley are affected by the inflow of Colorado River waters, the rate of evaporation, the depth of the agricultural tile drains beneath farm lands, and seepage from drains and rivers. The Colorado River is probably the most important source of recharge into shallow ground water aquifers; approximately ten percent percolated to underlying aquifers. Canals, such as the All-American and the East Highline, contribute to recharge because they are unlined; they are sometimes up to 200 feet wide; the All-American Canal flows across many miles of sandy terrain; and the water surface of the canals are higher than the general groundwater levels.

Drainage from agricultural fields has resulted in local high salinity because of the leaching of salts from these fields. In other areas, mounds of good quality fresh water have resulted from seepage from irrigation canals. This has occurred significantly in the unlined major canals and the All-American, East Highline, and Coachella canals.

Recharge by underflow from tributary areas is small compared to recharge that comes from the Colorado River. Direct recharge from rainfall is very minor, however on higher alluvial slopes of the southwestern mountains, precipitation can be sufficient for recharge by direct infiltration. This also occurs from runoff, mainly in washes and drainages which discharge to the central part of the valley and the Salton Sea.

Waters within the shallow aquifers of the Salton Trough generally move at right angles to contours lines, and towards the Salton Sea. Based on pumping data and water studies on various wells, groundwater is from six to eight feet below the ground surface level throughout most of the Imperial Valley. Shallow groundwater quality is best on the eastern and western sides of the County. Significant groundwater of good quality can also be found in the Ocotillo-Coyote Wells Groundwater Basin.

The deep water reservoir underlying Imperial Valley has been estimated at 1.1 billion to 3.0 billion acre feet, with total recoverable water estimated to be about twenty percent of the water in storage. Annual recharge is about 400,000 acre feet from various sources.

The deepest groundwater is in some cases believed to be moderately altered ocean water. Above this level, the water may consist of residuals from prehistoric fresh water lakes that filled the Salton Trough. Waters at this level vary from low to moderate salinity. The next higher layers are high temperature, and in places highly saline waters.

In the central part of the Imperial Valley, the groundwater is of a higher salinity. Most wells had total dissolved solids concentrations of between 1,000 and 3,000 mg/L. The ionic composition of the water in the central part of the valley is similar to that of the East Mesa. However, as the total dissolved solids concentration increases, the ionic composition becomes



more dominated by sodium chloride. The pH of these waters is usually slightly basic, with an occasional value less than seven.

In the western section of the valley, water quality varies widely. Almost all of the wells in Coyote Valley had total dissolved solids concentrations below 500 mg/L; however, West Mesa wells had levels between 1,800 and 5,200 mg/L.

For planning and reporting purposes, the Colorado River Basin Region has been divided into seven major planning areas by the Regional Water Quality Control Board. The basis for this division is due to the fact that each areas has different economic and hydrologic characteristics. The seven planning areas are:

1. Lucerne Valley
2. Hayfield
3. Coachella Valley
4. Anza-Borrego
5. Imperial Valley
6. Salton Sea
7. Colorado River Basin (East)

Of the seven planning areas, portions of the latter four lie within Imperial County. Each of these planning areas are further discussed in Appendix B in relation to groundwater hydrology and quality.

#### **4. Water Pollution**

In order for an area to develop, it has to have sufficient resources. One of the most important and valuable resources is water. Water attracts people to develop where this resource is abundant and is put to beneficial use. However, not all water can be put to beneficial use if it is contaminated. A major problem with water quality that concerns many people is that of water pollution. There are a variety of issues that cause, or have potential to cause water pollution. In Imperial County, these issues include pesticide and fertilizer contamination of agricultural drains, geothermal developments, discharge from Mexico, and landfills in the County.

##### **Agricultural Drains**

Water pollution can be defined as any contamination of water that lessens its value to humans and nature. In the context of ecosystem function, pollution represents an imbalance of one or more elemental cycles. There are two broad classes of water pollution. One is point pollution which has its source in a well defined location, such as the pipe through which a factory discharges waste into a stream. The other is non-point pollution which has its source spread over large areas such as farms, grazing lands, construction sites, and the gardens, lawns, streets, and parking lots of cities.





There are two particularly disturbing aspects of groundwater pollution. One is that it can take years for some pollutants to move from the earth's surface into groundwater supplies. The other is that once the pollutants are in the ground, they can remain at problem concentrations for many decades. Studies performed by the Regional Board and U.S. Geological Survey indicate that drainage water in the Imperial Valley contains pesticides in quantities which often exceed the Environmental Protection Agency's criteria for protection of fish and wildlife. High levels of sediments and nutrients were also found.

For many years groundwater was assumed to be safe from chemical pollution because contaminant movement was thought to be restricted to the top few inches of the earth's surface. During the late 1970's, scientists realized that certain kinds of pesticides, such as Dibromochloropropanes (DBCP), are capable of moving through the soil and mixing with groundwater. DBCP is a soil fumigant used to kill nematodes in the soil before planting a certain crop. In the Imperial Valley, the agricultural fields of lettuce, carrots, and tomatoes are sprayed with DBCP. There is potential for groundwater contamination from this process.

Water quality problems in drains have been attributed to discharge of irrigation surface runoff, such as tail water containing pesticide residues, fertilizers, and silt to receiving waters; drift of pesticides into adjacent waterways from aerial application; and mechanical dredging of drains, which in some reaches results in depletion of dissolved oxygen and suspension of chlorinated hydrocarbon pesticides.

Numerous governmental programs have been established to identify and correct existing pollution problems, as well as to prevent further groundwater contamination. Many of these programs are only a few years old and need to be continued for many years to be effective. If these programs are effective, water resources would be free of most pollutants detrimental not only to the environment but to the population as well.

### **Geothermal Developments**

Extensive geothermal resources have been identified in several areas of the Imperial Valley. These are identified as Known Geothermal Resource Areas (KGRAs). Power plants are currently generating electricity from the hot water resources in the Salton Sea, the Heber KGRA, and the East Mesa KGRA. The fifteen existing power plants can generate about 300 megawatts, and it is estimated that the Imperial Valley resource could support approximately 2,750 megawatts of power production on a sustained basis.

Geothermal fluids in the largest and hottest field, the Salton Sea KGRA, contain about twenty-five percent dissolved solids by weight. These fluids also contain marginally hazardous levels of arsenic, antimony, lead, mercury, zinc, and a large amount of other potential pollutants, including ammonia, boron, copper, lithium, selenium, strontium, and manganese.



The Heber and East Mesa KGRA's have fluids that are much cleaner by comparison, and contain less than two percent dissolved solids. Drilling has identified additional potential resources in the Brawley, Westmorland, and Salton City areas.

Geothermal power plants extract hot water through large wells drilled from 2,000 to 12,000 feet below the surface. The hot water is either allowed to boil to produce steam or passed through heat exchangers. Return flows of hot water from both processes are injected back into the geothermal reservoirs through separate wells. The problems of contaminating the surface waters or nearby non-geothermal groundwaters exists if the return flows are not injected to a significant depth; if they are injected under too much pressure; if they are injected into faults or fractures than connect to the surface; or if the injection wells leak. The potential for surface spills exists from pipeline failures or well blowouts.

In addition, land subsidence is a potential effect of geothermal developments. Currently, most of the extracted fluid is returned to the reservoir by injection, with the remainder being vented to the atmosphere as steam. This problem can be expected to increase as more power plants are built, although the natural subsidence of the Imperial Valley occurs at a rate of about one inch in ten years.

### **Discharges from Mexico**

Mexico is probably the largest contributing factor to increasing water pollution in the Imperial Valley via the New River. The New River originates in Mexico, and flows northward across the International Boundary into Imperial County, California. The flow continues through the Imperial Valley and ultimately discharges into the Salton Sea. The primary purpose of the New River is to convey agricultural drainage in the Imperial and Mexicali valleys to the Salton Sea. A corollary use of the New River is to convey treated community and industrial wastewaters. This corollary use is strictly controlled in the Imperial Valley by waste discharge requirements prescribed and enforced by the California Regional Water Quality Control Board. However, Mexico's corollary use of the New River is largely ignored and uncontrolled.

Mexico discharges raw and inadequately treated sewage, toxic industrial wastes, garbage and other solid wastes, animal wastes, and geothermal waste waters out of the Mexicali area of Mexico and into the Imperial Valley. This process has continued for over forty years, resulting in the on-going pollution of the New River at the International Boundary. As Mexico's industry and population continue to grow, these problems have a high potential to increase if corrective measures are not taken.

Until August of 1983, the problem of Mexico polluting the New River had been the responsibility of United States Section of the International Boundary and Water Commission (IBWC), a joint United States/Mexico federal agency with responsibility for dealing with border water and sanitation problems between the two nations.





For over thirty years, the California Regional Water Quality Control Board has made several representations to the United States Commissioner on the IBWC to obtain corrections to the problem. Since 1975, the California Regional Water Quality Control Board has been monitoring water pollution of the New River to identify the pollutants actually coming from Mexico. This information has been presented to the United States Commissioner to aid and encourage Mexico in implementing corrective measures.

In August of 1980, Minute No. 264 to the Mexico-American Water Treaty was signed, which specified time schedules for completing work that was to result in a full cleanup of the river. In addition, minimum water quality standards were specified for New River water quality at the International Boundary. Mexico has been in violation of practically all of the specified schedules and standards since Minute No. 264 went into effect in December of 1980. There is no evidence that Minute No. 264 has had any influence on actions in Mexico to clean up the river.

In July of 1983, the California Regional Water Quality Control Board conducted an investigation. The purpose of the investigation was to determine the type(s) and extent of waste discharges into the New River and its tributaries from Mexico so that possible corrective action could be considered and pursued. The investigation identified problems that must be addressed to obtain adequate corrections. These problems included:

1. City sewer lines which are not connected to the City's main sewer system discharging raw sewage to the river;
2. Breakdowns in the sewer system resulting in the discharge of raw sewage to the river;
3. Discharge of wastes to the river by septic tank pumpers;
4. Discharge of wastes to the river from adjacent unsewered residences;
5. Discharge of untreated industrial wastes to the river including highly toxic chemicals wastes, many of which are on the Environmental Protection Agency's list of 129 priority pollutants and some of which are carcinogens;
6. Inadequate treatment of sewage and industrial wastes by Mexicali, whose sewage treatment plant consists of nothing more than raw sewage lagoons;
7. Location of the City's garbage dump such that refuse is disposed of directly into the river water;
8. Discharges of untreated wastes from a slaughterhouse, dairy, and hog farms;
9. Discharges from residential hog and cattle pens located adjacent to the river and its tributaries; and





10. Discharge of geothermal wastes to the river.

In August of 1983, a United States/Mexican Agreement for protection and improvement of the environment in the border area was signed by the Presidents of Mexico and the United States. Under this agreement, responsibility for border environmental problems, including the New River pollution problem, was transferred from the International Boundary and Water Commission to the United States Environmental Protection Agency for the United States, and to the Mexican Secretariat de Desarrollo Urbano y Ecologia (SDUE) for Mexico. Since this transfer of responsibility, progress has been slow and it is questionable if the agreement has served any useful purpose in controlling pollution in the New River.

In April of 1987, Minute No. 274 to the Mexican-American Water Treaty was approved by the United States and Mexico. The minute provided for a \$1.2 million United States/Mexico jointly funded project to construct certain works in Mexico to reduce pollution in the New River. Although this project is just a step towards resolving the pollution problems of the New River, it sets a precedent for the involvement of the United States in the implementation of corrective actions within Mexicali.

According to the International Boundary and Water Commission of the United States, additional projects are needed to help reduce water pollution from Mexico. Mexico and the United States are currently negotiating measures to solve the problem. Upon agreement between both governments, a new Minute will be approved and added to the Mexican-American Treaty to supersede Minute No. 274. The main goal of the new Minute would be to establish a long-term solution to the water pollution problem.

Aside from the New River, the Alamo River is polluted with contaminants as well. The Alamo River flows into Imperial County from Mexico and has low pollutant concentrations. Presently, the Alamo River is very small as it crosses into the United States and carries agricultural water coming from agricultural fields in Mexico. The main pollutants in the water are pesticides which get drained into the Alamo River during irrigation. However, the potential for polluting the Alamo River could increase not only from the pesticides contained in the water but from potential development at or near the Alamo River at the International Boundary. A new border crossing is to be constructed at or near the Alamo River as it crosses into the United States. This new border crossing could create an "urban sprawl" effect in this area of Imperial County, which would increase drainage into the Alamo River. The Alamo River currently has a small concrete culvert that passes underneath the All-American Canal which drains water coming from Mexico and eventually into the Salton Sea. Additional flows could clog the culvert and present a financial burden to Imperial County and lead to environmental health problems.

An option proposed by the California Regional Water Quality Control Board has been to shunt the Alamo River into a drainage system which would eventually drain into the New River before it crosses into the United States. In order for this to happen both governments must agree. Presently, nothing has been settled but further negotiations are currently being reviewed between



the United States and Mexico, in hopes to minimize potential problems that could result from the development of the new border crossing.

## **Landfills**

Another potential problem that may contribute to the pollution or contamination of groundwater is landfills. There are three different types of landfills within the County. These are classified as Class I, Class II, and Class III. A Class I landfill site is for the sole purpose of dumping hazardous wastes, a Class II landfill site is for dumping designated and/or special waste, and a Class III landfill site is for dumping non-hazardous wastes such as municipal waste.

Currently there are ten County-operated Class III disposal sites throughout Imperial County which accept non-hazardous wastes (Figure 3). Four of the County landfills, near Brawley, Hot Mineral Spa, Imperial, and Calexico, are under the ownership or control of the County; five, Holtville, Niland, Salton City, Ocotillo, and Palo Verde, are on Bureau of Land Management (BLM) property; and one, the Picacho landfill, serves the Winterhaven/Bard area and is located on land owned by the Quechan Indian Reservation.

In addition to the public sites, Imperial Republic Acquisitions operates a private Class III waste disposal facility in the unincorporated area northwest of the City of Imperial; Laidlaw Environmental Services operates a Class I facility west of the City of Westmorland; and Desert Valley Company operates a Class II solid waste disposal/storage site northwest of the City of Westmorland.

For more detailed information on solid and hazardous waste disposal sites, please refer to the Health Department, Imperial County Hazardous Waste Management Plan. The Imperial County Integrated Waste Management Plan is being prepared by the Department of Public Works, with a draft to be presented to the State Integrated Waste Management Board in January 1994.

## **5. Water Use Patterns**

### **Agricultural Water Use**

There are over 120 types of crops grown in the Imperial Valley. Most relevant to the Water Element is an examination of the various crop types, the acreage dedicated to each and the demand for irrigation water generated by each crop per acre of cultivation. Water demand is provided below on a "net consumption" basis and is based upon historical acreage and water use data. Major water consuming crops include alfalfa (5.20 ac.ft./acre), asparagus (4.12 ac.ft./acre), cotton (3.45 ac.ft./acre), and tomatoes (2.23 ac.ft./acre). More efficient crops include carrots (1.21 ac.ft./acre), squash (1.58 ac.ft./acre), and barley (1.64 ac.ft./acre). The historical trend indicates that approximately 525,000 acres are in cultivation over the year and that crops grown on this acreage consume approximately 1,771,000 acre feet per year. Table 2 shows the historical average of individual crop acreage and water use in Imperial Valley over a ten year period.





**TABLE 2**  
**CROP ACREAGE AND WATER USE IN IMPERIAL VALLEY**  
**HISTORICAL AVERAGE**

Crop	Area (Acres)	Water Use (af)
<b>Garden Crops</b>		
Broccoli	7,000	11,480
Carrots	12,000	14,540
Lettuce	35,000	47,017
Cantaloupes	15,000	33,213
Watermelons	5,000	10,929
Other Melons	4,000	8,903
Onions	10,000	17,725
Squash	1,000	1,578
Tomatoes	3,000	6,695
Vegetables (misc.)	5,000	8,083
<b>Field Crops</b>		
Alfalfa	185,000	961,692
Barley	1,000	1,650
Bermuda Grass	15,000	52,125
Cotton	40,000	137,900
Rye Grass	4,000	9,500
Sorghum	3,000	7,330
Sudan Grass	20,000	47,500
Sugar Beets	35,000	122,208
Wheat	105,000	204,488
Miscellaneous	2,000	4,695
<b>Permanent Crops</b>		
Asparagus	3,000	12,355
Citrus Fruits	2,000	7,163
Duck Ponds (feed)	8,000	24,000
Jojoba	3,000	10,745
Trees and Vines	1,000	3,582
Miscellaneous	1,000	3,982
Source: Water Requirements and Availability Study. Prepared by Parsons Water Resources, Inc. for the IID. November 1985.		



Agriculture is the most highly water consumptive use in Imperial County. Approximately ninety-eight percent of the water diverted to Imperial County from the Imperial Irrigation District is used for agricultural purposes. Imperial Irrigation District supplies more than 2,500,000 acre-feet of water annually for primarily agricultural purposes to its customers in Imperial County, which contains over 500,000 acres of irrigated farmland.

In addition to the water being diverted to the Imperial Valley by the Imperial Irrigation District, five other water districts supply water to other areas in Imperial County outside the Imperial Irrigation District boundaries. These are the Palo Verde Irrigation District, the Palo Verde County Water District, the Bard Water District, the Winterhaven Water District, and the Coachella Valley Water District.

The Palo Verde Irrigation District supplies water to approximately 9,000 acres of agricultural lands in Palo Verde. The water is strictly for irrigation purposes and is taken from the Colorado River. All water drained from these agricultural fields drain back into the Colorado River. Currently, the Palo Verde Irrigation District has an unlimited allocation for water as long as it is used for beneficial uses in agriculture. The Palo Verde County Water District is responsible for supplying water to residents of the community of Palo Verde for domestic purposes. This is further discussed in the following section under the sub-heading "Urban Water Use".

The Bard Valley is located at the southeastern corner of Imperial County, better known as the Reservation Division of the Bureau of Reclamation. The Bard Water District serves approximately 175 landowners and supplies approximately 90,000 acre-feet of water per year for approximately 15,000 acres of agricultural land. The water is used for irrigation purposes only and is taken from the Colorado River, via the All-American Canal. All drainage from the irrigation fields is drained back into the Colorado River. Domestic water uses in Bard are further discussed in the following section.

### **Urban Water Use**

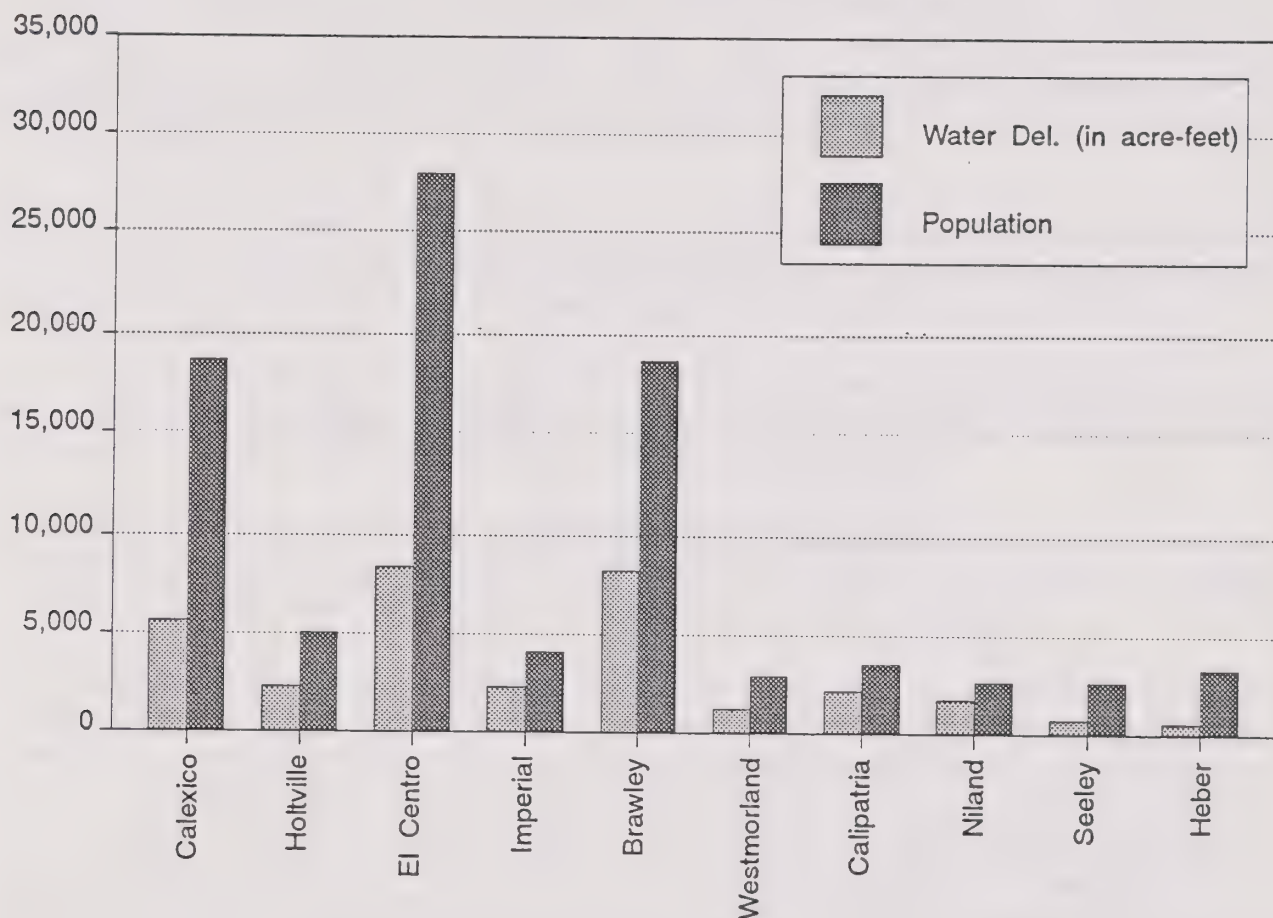
Domestic water uses account for approximately two percent (2%) of the total water use in the County. There are ten communities in Imperial County that receive water for domestic purposes from the Imperial Irrigation District, Calexico, Holtville, El Centro, Imperial, Brawley, Westmorland, Calipatria, Niland, Seeley, and Heber. Each city and unincorporated community has its own water treatment facilities for treating and distributing water to the users of each jurisdiction. Table 3 shows the average water use per capita for each jurisdiction from 1984 to 1990.

The chart represents an averaging of the population in each community over the 1984-90 period, as well as the averaging of the water deliveries to each of these communities over the same period. The graph helps to illustrate the population/water demand relationship for each of these communities, and the averaging of several years data to smooth some of the anomalies in the year to year data.





**TABLE 3**  
**AVERAGE YEARLY POPULATION/WATER DELIVERY**  
**1984-1990 BY COMMUNITY**



As mentioned earlier, five additional water districts supply water to other areas in Imperial County. Of these, the Palo Verde County Water District (PVCWD), Winterhaven Water District (WWD), and the Coachella Valley Water District (CVWD) distribute treated water for domestic use. The PVCWD is responsible for supplying water to approximately 162 customers for domestic purposes. The PVCWD has a deep water well in the community of Palo Verde which extracts water from the ground water basin, is then treated at a plant before it is distributed to its customers. The well extracts approximately 45,000 gallons per day and the quality of water is fairly good. In addition, sufficient water supplies exist to accommodate growth of the community of Palo Verde in the future.

The WWD supplies water to approximately 1,000 people in Winterhaven. The WWD uses two wells, one of which is a standby well, to extract approximately 150,000 gallons of water per day from the groundwater basin for domestic purposes. The groundwater basin is recharged by the





Colorado River, which passes just south of Winterhaven. The community of Winterhaven has two 100,000 gallon storage tanks for storing domestic water. A sewage system serves Winterhaven and also a few developments within the Indian Reservation lands adjacent to the community of Winterhaven. A water treatment facility in Winterhaven treats sewage and then is discharged and piped to Yuma, Arizona. This is a joint venture between the community of Winterhaven and the Indian Reservation lands under a grant from the Federal Government. The pipeline is approximately sixteen inches in size and decreases to a ten inch line at the bridge crossing to Yuma.

The community of Winterhaven presently holds a perfected right to divert 780 acre-feet per year from the Colorado River. This perfected right was granted by the United States Supreme Court supplemental decree in *Arizona v. California*, dated January 9, 1979.

In the community of Bard, wells are used to extract ground water for certain domestic purposes such as watering landscapes and taking baths. Drinking water sources are supplied by 100 gallon tanks which are filled periodically by private water companies.

The Salton City and Hot Mineral Spa/Bombay Beach communities are provided water for domestic use from the Coachella Valley Water District. The CVWD, which primarily operates in Riverside County, receives Colorado River water via the Coachella Canal.

The communities of Ocotillo, Nomirage, and Yuha Estates rely on groundwater from the Ocotillo-Coyote Wells groundwater basin. The County of Imperial commissioned a study of the groundwater basin by the USGS, known as the Skrivan Report, which was released in November of 1977. The report states that an annual overdraft of 500 acre feet exists and warns of possible saline intrusion. The County also employed Dr. David Huntley, a geohydrology consultant, to review the report and the basin. His 1979 report titled "The Magnitude and Potential Effect of Declining Ground Water Elevations in the Ocotillo-Coyote Wells Basin" projects even greater overdraft of between 1608 and 2410 acre feet per year. He also projects saline intrusion. Future growth in Ocotillo/Nomirage is therefore expected to consist primarily of infill on existing lots, rather than expansion of community boundaries, except at very low densities.

Other areas that use wells to extract water from the groundwater basin are the East Mesa Unit and the West Mesa Unit within the Imperial Irrigation District boundaries. The East Mesa Unit has four wells that are approximately six hundred feet deep. Scattered residential development occurs in the East Mesa Unit along with some mines. As mentioned earlier, there are some geothermal developments in the East Mesa Unit that may have potential to cause water pollution.

The West Mesa Unit is primarily land that is owned or regulated by the Bureau of Land Management. A portion of the land in the West Mesa Unit is used by a Naval Air Facility for bombing practices and exercises. Water delivered to the Naval Air Facility comes from the Elder Lateral Canal. From June 1, 1986 to October 23, 1991, the NAF has used approximately 3,714 acre-feet of water, with a daily average water use of 2.0 acre-feet.



The lining of the Coachella Canal has reduced water losses due to seepage, however it has not affected the wells in the area. The Coachella Canal is approximately 123 miles long and all but approximately thirty-two miles are lined. The goal of the Coachella Valley Water District is to completely line the Coachella Canal. Currently, no date has been set for when this project is to take place.

## **Recreational Water Use**

Some of the waterways throughout the County also provide recreational activity, with the Colorado River being the most widely used. In addition, Ferguson, Martinez and Squaw Lakes along with Sender Reservoir, provide recreational activity as well. A variety of recreational activities take place along the Colorado River and lakes, including fishing, boating, water skiing, jet skiing and campgrounds. These recreational areas are owned and operated by a number of Federal, State and Local agencies, such as the United States Bureau of Reclamation, the United States Fish and Wildlife Service, the Bureau of Land Management, Riverside and Imperial Counties.

The Salton Sea is another area that provides recreational activities. The Salton Sea has been a popular recreation and marine sport fishery area. Several commercial marinas, residential recreational communities, and public parks are now located around the sea. Also, the Salton Sea State Recreation Area lies along twenty miles of its northeastern shoreline.

## **C. Trends**

### **1. Water Conservation**

The Imperial Irrigation District (IID) has initiated many water conservation programs in Imperial County. They have also participated in various programs in cooperation with governmental agencies. In addition, the District has offered public education programs and has encouraged innovative on-farm practices in the Imperial Valley. Its commitment to efficient regional water use management was most clearly demonstrated by the Water Conservation Agreement between Imperial Irrigation District and the Metropolitan Water District of Southern California.

Past water conservation efforts using innovative and creative programs have also helped Imperial Irrigation District to reduce water consumption. Some of these programs include structural, operational, administrative, educational, cooperative, and on-farm programs. Each of these programs is discussed in more detail below.

### **Water Conservation Agreement**

This Agreement provided for the implementation of water conservation projects, to be funded by the Metropolitan Water District, during a five year period. The projects are to result in an estimated conservation of 106,110 acre-feet of water annually. The funding from the Metropolitan Water District covers the costs of construction, operation, and maintenance of





projects. In return for funding these projects, and subject to conditions contained in the approved agreement, the Metropolitan Water District is eligible to divert additional water, equivalent to the amount of water conserved, through its Colorado River Aqueduct, which has its headworks at Lake Havasu, created by Parker Dam along the Colorado River.

Eighteen projects were selected for inclusion in the water conservation program based on individual cost-effectiveness, and as a reflection of the need to have a well-balanced overall program. The average amortized cost for the projects was estimated at \$128 per acre-foot in 1988 dollars. Construction of the projects began in February of 1990, and is scheduled for completion in December of 1994. Table 4 shows the water conservation projects that had been completed as of December 28, 1990. In addition, the estimated water conserved is also shown for each project.

<b>TABLE 4</b> <b>WATER CONSERVATION PROJECTS AND ESTIMATED WATER CONSERVED</b> <b>AS OF DECEMBER 28, 1990</b>	
<b>Project Description</b>	<b>Annualized Water Conserved</b>
Carter Reservoir	4,930 af
South Alamo Canal-Phase I	1,180 af
South Alamo Canal-Phase II	848 af
Lateral Canal Lining	6,706 af
12-Hour Delivery	12,000 af
Vail Supply Canal Lining	79 af
Non-Leak Gates	125 af
System Automation	324 af
Westside Main Canal Lining	508 af
<b>Total Water Conserved</b>	<b>26,700 af</b>
Source: "IID/MWD Water Conservation Agreement." Issue paper by Robert Lang, Assistant Manager, Imperial Irrigation District, February, 1991.	

To fully understand the effort that the Imperial Irrigation District has expended in achieving their water conservation goals, the following is an update on the status of the water conservation projects:

#### **Trifolium (Carter) Reservoir**

The completion of this project in 1988 utilized a Clean Water Bond, and consisted of a 340 acre-foot regulating reservoir. The project was to eliminate operational discharge



at the end of the Westside Main Canal. The project is to conserve 4,930 acre-feet of water annually.

### **South Alamo Canal Lining-Phase I**

Two miles of this large supply canal were lined and completed in August of 1989 with the assistance of a Clean Water Bond. Seepage of water was reduced and 1,180 acre-feet of water has been conserved.

### **South Alamo Canal Lining-Phase II**

In addition to the first phase of this project, Phase II consisted of concrete lining the remaining 1.2 miles, and was completed in June of 1991. To date, the Imperial Irrigation District has conserved over 1,425 acre feet of water annually from this project.

### **Lateral Interceptor**

This project consists of utilizing a header canal and 283 pond leveling gates to create a virtual demand system for eight lateral canals. The project will cost \$5.7 million and construction is currently underway.

### **"Z" Reservoir**

The District has a total of five regulating reservoirs. Four have been built since 1975 at a total cost of \$3.3 million and provide a total storage capacity of 1,570 AF. It is estimated that 6,200 AF of water is conserved annually through the use of these reservoirs, which help reduce operational spills from the canal systems they serve. The fifth reservoir is presently under construction and consists of a 400 AF capacity regulating reservoir. The project carries a cost of \$2.8 million and will conserve water by eliminating operational spills at the end of East Highline Canal.

### **Lateral Canal Lining**

Between February and December of 1990, the Imperial Irrigation District concrete lined over 62 miles of lateral canals. The District is to concrete line 265 miles by December of 1994. This project will reduce seepage and increase efficiency of the canal delivery system. The project is projected to cost \$50 million and has, to date, conserved over 6,846 acre-feet of water annually.

### **Trifolium Interceptor**

This project is similar to the Lateral Interceptor, in that its main purpose is to use a header canal and pond leveling gates to eliminate operational spills and minimize





tailwater. The project encompasses thirteen large lateral canals and is projected to cost \$10 million. Research and design of this project are still underway.

### **Twelve-Hour Delivery**

In the past, water delivery to farmers of the Imperial Valley was on a fixed 24-hour basis. In February of 1991, the Imperial Irrigation District initiated a new program which allows farmers to order small delivery heads (up to 7 cubic feet per second) on a fixed 12-hour basis. The program also allows for cutoff of the delivery within the last four hours, if the canal capacity permits. The farmers in the Imperial Valley have widely accepted this program. The program is estimated to conserve approximately 12,000 acre-feet annually.

### **Non-Leak Gates**

This project consists of replacing the old wooden canal check gates with non-leaking aluminum gates. These types of gates were installed in June of 1990. This project has enhanced the operation of canals and also prevented water leakage. The five gates have conserved an estimated 125 acre-feet of water per year. The installation of all remaining gates is expected to be completed by the end of 1992.

### **Lowline Interceptor**

This project is another lateral interceptor which will collect operational discharge and minimize spill from approximately sixteen other lateral canals. The project will cost \$5.3 million, and construction is scheduled to begin in 1993. The project is currently in the research phase of development.

### **Irrigation Water Management**

Funds are used for this project to construct water conservation systems on farms. The purpose is to educate farmers on the most advanced irrigation management techniques by providing training and support. Agricultural engineers from Imperial Irrigation District plan to implement this program onto 10,000 acres of farmland. Pump back, drip irrigation and other systems, along with updated irrigation planning techniques, are used for water conservation. Thirty-four on-farm systems are currently in development.

### **System Automation**

This project is by far the most innovative water conservation program. The cost is \$15 million, and it will radically improve Imperial Irrigation District's control of water delivery. Computers will be located on fields and will control the water gates to manage the delivery of water more accurately. The monitoring of the computer will be done by a radio-microwave system from a master water control center.





This will centralize water management and monitoring for Imperial Irrigation District. Approximately 200 field sites will provide data and be utilized to allow water control never pursued before. The program is composed of over 60 projects and has already seen the automation of five canal headings and the installation of the radio-microwave communications network. A new Water Control Center will be added to the system and is scheduled to be operational by December of 1991. Other water conservation programs include land leveling, tailwater pump back systems, low water-use crop selection, and low water-demand irrigation methods.

### **Structural Programs**

Structural programs to conserve water include physical changes to the water conveyance and usage system that will bring about benefits independently of user practices. These programs consist of such projects as canal lining to reduce seepage losses; construction of regulating reservoirs to reduce canal spill; construction of seepage recovery lines to collect water to be pumped back into the canal for delivery to farms; farm delivery and outlet structures to provide for better water control and measurement of farm deliveries and to facilitate measurement of tailwater runoff; automatic controls and remote monitoring facilities to be operated manually in case of power outages; and construction of evaporation ponds to reduce inflow into the Salton Sea.

### **Operational Programs**

Operational Programs refer to changes in operational procedures that have been initiated to promote water conservation. Operational programs include radio equipment and personnel training. Communication among personnel permits greater operational flexibility in switching water deliveries from one farmer to another, thereby reducing operational spills.

As newer methods are used and more structures are built, water department employees must be trained to manage and operate them. Daily on-the-job training is an integral part of the program. In addition, specialized training in water measurement and management is given to the new hydrographers. Keeping up on the latest methods of water management and operations can help in conserving water for Imperial County.

### **Administrative Programs**

These programs are options that are available to public distributors of water. An example of this would be the establishment of incremental water rates to encourage water conservation. The IID Board of Directors, recognizing the need to continue to expand water conservation efforts, appointed a Water Conservation Advisory Board made up primarily of farmers in 1979. The purpose of the Advisory Board is to make recommendations to the District Board regarding the implementation of additional water conservation measures.



The District approved a water conservation program called the "13 Point Program" in 1976. The overall goal of this program was to improve water use efficiency within the District and reduce inflow into the Salton Sea. Another program, the "21 Point Program", was recommended by the Water Conservation Advisory Board and adopted by the District.

### **Educational Programs**

Educational programs have been implemented to encourage water conservation within the Imperial Valley. These programs range from public meetings to get input from the property owners themselves, to full-scale demonstrations so that others can see how new irrigation techniques and methods are used.

### **Cooperative Programs**

The District has been involved in various cooperative studies and programs to research innovative water conservation methods. Different levels of involvement have been required of the District. For example, the District has helped the USDA Research Station in Brawley by constructing a lysimeter to determine crop water consumption; helped to construct an underground soil column laboratory, a reservoir, and a pumping station; installed four evaporation and weather stations; and provided labor, equipment, and materials for a five year irrigation efficiency study.

The District has also cooperated with the University of California Irrigation Management Information System and mobile laboratory programs sponsored by the University in conjunction with the California Department of Water Resources (DWR).

### **On-Farm Irrigation Programs**

Farmers have been practicing on-farm irrigation methods to conserve water. Agricultural lands must be tiled, graded, and prepared for the application of water. Tile drains have been installed and, in addition, head ditches have been lined to reduce water loss due to seepage. This program is still in effect.

## **2. Miscellaneous Programs to Reduce Salton Sea Inflow**

Water conservation is designed to reduce losses, most of which contribute to the inflow to the Salton Sea. Assuming that other inflow elements remain unchanged, the level of the Sea is expected to decline. However, recognizing that conservation programs take time to implement, whether the time is five years or twenty years, other alternative programs need to be considered that can be applied in a shorter time period.





The following are several proposals that could be looked into to help reduce inflows into the Salton Sea.

- a. The continued use of spreading drain water on available idle land by ponding, flooding or sprinkling.
- b. Constructing storm detention basins on the East and West Mesas.
- c. Irrigation with free drain water (through the cooperation of landowners) and alternating with canal water.
- d. Pumping water from the Salton Sea to shallow ponds adjacent to the Sea.
- e. Pumping water from drains to shallow ponds on the East and West Mesas (or other available lands) for wildlife ponds/marshes or other uses.
- f. Supporting the continued investigation of diverting the New River at or south of the Mexican Border to Laguna Salada in Mexico.
- g. Separating tile drain flows from tailwater to reuse surface runoff.

### **3. Environmental Management**

In accordance with the California Environmental Quality Act (CEQA), IID has by resolution adopted the State CEQA guidelines. These guidelines provide that certain programs are exempt from preparing environmental assessments. Programs in this category include concrete lining existing District canals, installing pipelines for portions of laterals and drains, installing road crossings and replacing existing water system structures.

The District has prepared a declaration of negative impact for each regulating reservoir, and it will continue to file this type of environmental review for similar projects. As major projects in the Water Conservation Plan of 1985 have been prepared for implementation, an environmental assessment as required by the CEQA guidelines will also be prepared. The major environmental issues expected to be of concern with local water system projects are:

- a. Reduction of flows in drains.
- b. Reduction of inflow to Salton Sea.
- c. Increase of salinity of drain waters.
- d. The impact of these three factors on fish and wildlife, recreation and aesthetic values.



### **III. GOALS AND OBJECTIVES**

#### **A. Preface**

Many of the major water resource issues faced by the County now and in coming years include the threat of continued deterioration of surface and groundwater resources, the possible reduction of available Colorado River water caused by increased demand and adverse climatic conditions, as well as the balancing of urban and agricultural needs with those of plants and wildlife.

Pollution of surface waters from urban development primarily in the Republic of Mexico, but also in the County, continue to pose a serious threat to groundwater and surface water resources in the County. These issues also include the continued increase in salinity of the Salton Sea, as well as the high agrichemical and suspended solids load draining into the Sea, which have an adverse impact on sport fishing and other recreational uses associated with this important resource.

The Water Element goals are developed as broad based statements reflecting the County's values, aims, and aspirations for management of this vital resource. These goals address the physical development of the County as well as the wise use and preservation of the County's important water resources. The programs set forth herein have been developed to implement the goals and objectives of the Water Element. The policies set forth specific performance requirements for the various plans which relate to water issues in Imperial County.

The goals and objectives are not to be inclusive and are general in nature. They are not to be considered as a means to regulate a specific area. Their main intent is for them to be implemented only to the extent that such implementation is achieved by reasonable regulations or rights therein. The goals and objectives may change at any time to accommodate appropriate growth within the County.

#### **B. Goals and Objectives**

##### **Adequate Domestic Water Supply**

Goal 1: The County will secure the provision of safe and healthful sources and supplies of domestic water adequate to assure the implementation of the County General Plan and the long-term continued availability of this essential resource.

Objective 1.1 The efficient and cost-effective utilization of local and imported water resources through the development and implementation of urban use patterns.

Objective 1.2 Cooperation between the Cities and County for the need to maintain, upgrade, and expand domestic water and sewage treatment facilities of the communities within the County, the need for the implementation of appropriate development fees, and the raising of service fees to off-set limited public financial resources.





Objective 1.3 The efficient regulation of land uses that economizes on water consumption, enhances equivalent dwelling unit demand for domestic water resources, and that makes available affordable resources for continued urban growth and development.

### **Protection of Surface Waters**

Goal 2: Long-term viability of the Salton Sea, Colorado River, and other surface waters in the County will be protected for sustaining wildlife and a broad range of ecological communities.

Objective 2.1 The continued viability of the agricultural sector as an important source of surface water for the maintenance of valuable wildlife and recreational resources in the County.

Objective 2.2 A balanced ecology associated with the riparian and ruderal biological communities important as breeding and foraging habitats for native and migratory birds and animals occurring within the County.

Objective 2.3 Preservation of riparian and ruderal habitats as important biological filters as breeding and foraging habitats for native and migratory birds and animals.

### **Adequate Agricultural Irrigation Water Supply**

Goal 3: The County will secure the provision of safe and healthful sources and supplies of agricultural irrigation water adequate to assure the continuation of agricultural land uses as established by the County General Plan and the long-term continued availability of this essential resource.

Objective 3.1 The efficient and cost-effective utilization of local and imported water resources through the development and implementation of innovative agricultural use patterns.

### **Protection of Water Resources from Hazardous Materials**

Goal 4: The County will adopt and implement ordinances, policies, and guidelines that assure the safety of County ground and surface waters from toxic or hazardous materials and wastes.

Objective 4.1 The development and implementation of infrastructure and regulatory policies in the Republic of Mexico, which reduce contamination of the New River, Alamo River, and the Salton Sea.

Objective 4.2 The provision of safe and efficient community waste water treatment facilities which adequately service the present and future needs of residential,





commercial, and industrial development within the Imperial Irrigation District service area.

### Coordinated Water Management

Goal 5: Water Resources shall be managed effectively and efficiently through inter-agency and inter-jurisdictional coordination and cooperation.

Objective 5.1 Encourage and provide for the management and wise use of water resources for contact and non-contact recreation, groundwater recharge, hydroelectric energy production, and wildlife habitat as well as for domestic and irrigation use.

Objective 5.2 Aid in the protection and enhancement of limited water resources so as to provide for the indefinite use and maximum enjoyment.

### C. Relationship to Other General Plan Elements

State law mandates seven Plans or "Elements" for local government General Plans. Although the Water Element is not mandatory, it must comply with requirements that are requisite to all parts within a General Plan. Legislative intent must be fulfilled as set forth in Government Code, Section 65300.5: "...the General Plan and the parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency."

The Water Element Policy Matrix (Table 5) identifies the relationship between the Water Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 5 WATER ELEMENT POLICY MATRIX								
Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Open Space Conservation	Geothermal
Adequate Domestic Water Supply	X	X						
Protection of Surface Waters						X	X	
Adequate Agricultural Irrigation Water Supply						X		
Protection of Water Resources from Hazardous Materials	X				X			



#### **IV. IMPLEMENTATION PROGRAMS AND POLICIES**

##### **A. Preface**

Imperial County is seen as one of the most, if not the most, agriculturally productive regions in the world. In order to continue the deserved reputation of supplying the world with high quality food crops, the County must appreciate and conserve its vital resources which enable the production of such valuable crops. One of these important vital resources is water. The County must recognize and consider the future of its economy and agriculture is the primary sector. Obviously, the continued urban growth in the County is equally dependent upon receiving adequate water resources.

Through water conservation measures, programs and policies, the County and the District will continue to efficiently utilize this valuable resource as it has done in the past. Also, water conservation projects with other agencies such as the "Water Conservation Agreement between Imperial Irrigation District and the Metropolitan Water District of Southern California" will enhance the availability of water within the County and encourage additional water conservation projects. With continued monitoring of the surface waters in Imperial County by the Imperial Irrigation District and others, any increase in salt concentrations can be addressed in order to enhance water quality.

Recognizing that water is a vital resource, continued cooperation and coordination between Imperial County and other Local, State and Federal agencies, water resources can be conserved and used for all approved beneficial purposes, including continued growth and development in all economic sectors. Also, continued planning and coordination efforts by the County can assure that future developments will not only enhance the economy, but may also encourage various industries to relocate and create a more broad based economy in the County.

Overall, Imperial County has great potential to wisely utilize its water resources and enhance the quality of water for all beneficial uses. Strategies should be carefully planned and incorporated into the decision making process of the County to assure adequate conservation of its water resources and the availability of water in the future.

##### **B. Policies and Programs**

The following policies are statements of purpose and/or direction that are meant to help guide decision makers in making judgements on issues concerning water resources in the County. These policies specifically address the Objectives of the Water Element, which in turn accomplish the Goals of the Element. The Policy is presented first for each sub-heading, followed by more specific program statements.





## **1. Adequate Domestic Water Supply**

### **Policy**

The efficient regulation of land uses that economizes on water consumption, enhances equivalent dwelling unit demand for domestic water resources, and that makes available affordable resources for continued urban growth and development.

### **Programs**

- The County of Imperial shall regulate and encourage the economical use of domestic water resources through the implementation of applicable state codes and the promotion of drought resistant native and non-native desert landscaping in all types of urban development.
- The County of Imperial shall encourage the distribution of water conservation literature and signage in public restaurants, hotels and motels as a means of preserving domestic water treatment and waste water treatment facility capacities.
- The County of Imperial shall encourage the distribution of low cost water conservation technologies and literature to all households in the County as a means of assuring an affordable quality of life and of preserving the capacities of domestic water treatment and waste water treatment facilities.
- The County of Imperial shall encourage the metering of agricultural and urban water use, including encouraging municipalities to initiate water metering programs to promote more thoughtful and economical use of domestic water.
- The County of Imperial shall assure the enforcement and implementation of Section 17921.3 of the Health and Safety Code, Title 20, California Administrative Code Section 1601(b), and applicable sections of Title 24 of the State Code through the development and building permit process.
- The County of Imperial shall study the appropriateness of and need for impact and/or development fees, which can be used to preserve important water resources and assure their long-term availability.

## **2. Protection of Surface Waters**

### **Policy**

Preservation of riparian and ruderal habitats as important biological filters, and as breeding and foraging habitats for native and migratory birds and animals.



## **Programs**

- The County of Imperial shall take an active role in soliciting the support of state and federal agencies, particularly the California Water Quality Control Board and the U.S. Environmental Protection Agency, in the cleanup of the New River at the International Border.
- The County of Imperial Health Department, Parks and Recreation Department and other responsible agencies shall maintain programs and regulations to assure safe and healthful water resources for sport, recreation and wildlife uses.
- The County of Imperial, also with the Imperial Irrigation District, the California Department of Fish & Game and the U.S. Fish & Wildlife Service, shall cooperate and coordinate the use of water resources to protect and enhance valuable wildlife communities and habitats of the region.
- The County of Imperial shall take an active role in encouraging the development of infrastructure and a regulatory environment in the Republic of Mexico which addresses the chronic pollution of the New River and Alamo River from agricultural, industrial and urban development.
- The County Health Department shall report annually to the Board of Supervisors on the conditions of the New River at the International Border and within the County, and the progress made by state and federal agencies in reducing the level of contaminants being carried to the Salton Sea.
- As part of the effort to protect and enhance wildlife and their habitat, the County of Imperial shall actively pursue the preservation, maintenance of breeding and foraging habitat for native and migratory birds and animals, preserving these biological systems as indicators of environmental integrity, and as a source of sport and recreation.
- The County of Imperial shall monitor, coordinate and cooperate with State and Federal agencies to assure the protection of the Colorado River resource from over utilization and excessive export to protect urban and agricultural interests and to assure the health of the various biological habitats of the Colorado River.

### **3. Adequate Agricultural Irrigation Water Supply**

#### **Policy**

The efficient and cost-effective utilization of local and imported water resources through the development and implementation of appropriate and separate agricultural and urban use areas.



## **Programs**

- The County of Imperial shall play a pro-active role in encouraging the use of efficient and cost-effective methods of water conservation in all aspects of urban development as well as agriculture.
- The County of Imperial shall encourage the reclamation and use of agricultural and urban waste waters in urban landscaping, golf courses, and wildlife habitat areas wherever practical.
- The County of Imperial shall play a pro-active role in encouraging the efficient use and conservation of the Colorado River resource, and in maintaining an adequate allocation for local agricultural use in Imperial Valley.

## **4. Protection of Water Resources from Hazardous Materials**

### **Policy**

Adoption and implementation of ordinances, policies and guidelines which assure the safety of County ground and surface waters from toxic or hazardous materials and/or wastes.

### **Programs**

- The County of Imperial shall make every reasonable effort to limit or preclude the contamination or degradation of all groundwater and surface water resources in the County.
- All development proposals brought before the County of Imperial shall be reviewed for potential adverse effects on water quality and quantity, and shall be required to implement appropriate mitigation measures for any significant impacts.
- The County of Imperial shall coordinate with the California Regional Water Quality Control Board and incorporated cities to assure that discharge from community wastewater treatment plants meet or exceed applicable state and federal standards.
- The County of Imperial shall play an active role in assuring the advance planning necessary to provide community and/or industrial wastewater treatment facilities which keep pace with continued urbanization in the County.
- The County of Imperial shall support the investigation of innovative methods of wastewater treatment which reduces discharge of contaminants into County surface waters, while enhancing the ruderal and riparian habitats of the County.





- The County of Imperial shall direct staff of the County Health Department, Planning/Building Department, and other appropriate Departments, as well as the County Agricultural Commissioner, to review existing ordinances, policies and guidelines and determine their adequacy in protecting groundwater and surface water from contamination by hazardous materials and/or waste.
- The Imperial County Health Department, as the Local Enforcement Agency, shall continue monitoring operations at the various landfills across the County and shall periodically report on the impacts or potential impacts of these landfills on ground and surface water resources in the County.
- The County of Imperial shall confer and coordinate with the California Department of Health, Regional Water Quality Control Board and the U.S. Environmental Protection Agency to assure that these agencies are taking active steps to protect and reclaim groundwater and surface waters from contamination.

## **5. Coordinated Water Management**

### **Policy**

Encourage and provide inter-agency and inter-jurisdictional coordination and cooperation for the management and wise use of water resources for contact and non-contact recreation, ground water recharge, hydroelectric energy production, and wildlife habitat as well as for domestic and irrigation use.

### **Programs**

- The County of Imperial shall confer and consult with the Imperial Irrigation District and incorporated communities of the County to assure a coordinated and coherent water policy for all interested parties in the County.
- The County of Imperial shall actively consult and confer with IID and other Districts, and the incorporated communities of the County regarding the limitation or elimination of impacts to surface and groundwater resources due to agricultural and urban development.
- The County of Imperial shall lend its support to programs and policies of the State Water Resources Control Board, Regional Water Quality Control Board, and other agencies which promote the wise and efficient use of water resources. Particular attention shall be given to the State Water Resources Control Board's regulations pertaining to water quality control and land development.



- The County of Imperial shall regulate land development and natural resource management to protect the limited but important areas of the County which contribute to groundwater recharge.
- The County of Imperial shall support the continuance and development of hydroelectric resources in the County in conjunction with compatible resource protection and management policies.
- The County of Imperial shall encourage the fair and appropriate assessment of fees and charges for the deliveries of urban and agricultural waters, and for water treatment capacity.
- The County of Imperial shall take an active role in maintaining and enhancing river, sea, ruderal and riparian habitats, as well as other biotic systems in the County which contribute to enhance water resource protection and maintenance.
- The County of Imperial shall cooperate and coordinate with the Regional Water Quality Control Board and other responsible agencies to investigate the potential for the creation of additional wetlands as a means of providing tertiary waste treatment while expanding and enhancing wetlands habitat.
- All County of Imperial departments with responsibility for regulation or jurisdiction for oversight of issues of water resource management shall make every effort to coordinate activities and share information and resources to assure protection of this vital resource.
- The County of Imperial shall act in a pro-active, cooperative and coordinated manner with local, state, federal and international agencies responsible for maintenance of minimal standards for local surface and groundwater resources.





## APPENDIX A

### HISTORY OF IMPERIAL VALLEY WATER

The majority of land in Imperial County was, at one point, vacant desert. It was not until the aboriginal inhabitants settled in the area and made use of the land near the waterfront to produce agricultural crops to provide food which improved the soils of the area. The population then was largely Yuman-speaking. In historic times, the Mohave, Quechan, and Halchidhoma tribes all probably lived in the area at various times. The Colorado River Basin Region was home to the Halchidhoma until about 1826, when the combined attack of the Quechan and Mohave resulted in more than 250 casualties to the resident tribe.

The survivors fled to the Gila River where they joined the Maricopa tribe and lost their identity. Their vacated territory was soon filled by a division of the desert-dwelling, Shoshonean-speaking Chemehuevi, an off-shoot of the Southern Paiute. Today, the Fort Mojave, Chemehuevi, Colorado River, and Yuma Indian Reservations are located along the Colorado River.

Subsistence along the river mainly on intensive collection of wild plant foods and flood water farming, supplemented by hunting and fishing. Mesquite was unquestionably the most important of the indigenous plants, but various cacti in the nearby plants were also important. The probable casual flood plain farming included such crops as corn, beans, squash and, in historic times, wheat, barley, and melons.

Villages were located near the river bank and houses were usually flat-topped ramada-like in design. As now, the river was capable of supporting large populations of aboriginal inhabitants, however, unfavorable floods meant fewer crops, and at such times full-time hunting, fishing, and gathering were required to sustain the tribe. At these times, tribes required more living space, and this led to competition for resources, theft of food, petty conflicts, and sometimes outright war. The warfare pattern was chronic, brutal, and always involved neighboring groups.

It is believed that the first European visitors came in 1776, traveling up the Colorado River looking for a better interior route from Yuma, Arizona to Monterey, California. They began settling and exploiting better agricultural practices that eventually led to the early development of small urban areas. However, there was still very limited development of urban areas, since riverfront agriculture continued to be the most dominant form of the area's economy.

The continued expansion of agriculture and the arid desert climate also created additional wildlife habitats. The Imperial Valley provides a dramatic mix of arid desert and water oriented habitat areas, which support a broad range of native and introduced year-round and migrant species of plants and animals. The sizable areas in active cultivation also provide important foraging habitat for numerous birds and small mammals. Important habitat areas include the Colorado River, agriculture related canals and drains, the Salton Sea and desert wash and flat-land areas.



These diverse and occasionally highly specialized communities constitute an important and valuable resource, which will require protection if their long-term value is to be preserved.

The idea of diverting the Colorado River to irrigate the desert lands of the Imperial Valley was conceived before the Civil War. In 1849, Dr. O.M. Wozencroft was probably the first to recognize this possibility as he crossed the Colorado Desert in route to San Francisco in search of gold. Though he died in 1887, several water appropriations were filed in 1895 by individuals to divert Colorado River water to irrigate lands in "that portion of San Diego County known as New River Country."

In 1896 the California Development Company was formed by C.R. Rockwood. Rockwood and his associates decided to call the area by various names, including Colorado Desert, Salton Basin and New River Country; the name we know today is Imperial Valley. Just prior to the turn of the century, Rockwood, an irrigation engineer, and his partner George Chaffey, sought to redirect Colorado River water to irrigate the potentially fertile soils of the Imperial Valley.

In 1900, excavation of a canal and construction of headworks on the Colorado River near Pilot Knob began, and in 1901, the first diversions of water were made to serve about 1,500 acres of crops. About 40 miles of the Imperial Canal, also known as the Alamo Canal, ran through Mexico before crossing into the United States east of present day Calexico. Within three years, silting of the headworks and upper reaches of the Canal led to the excavation of a temporary bypass channel about four miles downstream in Mexico.

For a few years the system worked well, however, in the fall of 1904, unseasonable flood waters on the Colorado and Gila Rivers broke into the bypass and down the Alamo Canal. For about two years the entire flow of the Colorado River poured into the Salton Sink forming the Salton Sea, an impressive salt water body created by a combination of natural and man-made events. The newly created sea was enormous in size (approximately 35 miles long and 15 miles wide).

In 1907, the Southern Pacific Company bought out the California Development Company and was successful in returning the Colorado River to its original channel. During the next several years, physical, financial and international complications, and legal problems plagued the project. The settlers decided to form a local agency which resulted in the formation of the Imperial Irrigation District (the District), a public corporation organized in 1911 under the California Irrigation District Act, California Water Code, Sections 20500 et. seq.

The District was to perform three chief functions: diversions and delivery of Colorado River water for agriculture and domestic purposes; operation and maintenance of drainage canals and facilities; and generation, transmission and distribution of electric power.

It was not until 1916 that financial and legal problems were settled so that the District could acquire the properties of the California Development Company and the Southern Pacific Company.





The All-American Canal and the Coachella Canal were constructed as unlined canals in the 1940's to bring Colorado River water into the Imperial and Coachella Valleys. Construction of the All-American Canal began in August 1934 and was completed in 1940. Water deliveries to the East Highline Canal began in October of 1940. In February of 1942, all Colorado River water diverted to the Imperial Valley was delivered via the All-American Canal.

The Coachella Canal was completed in 1948 and began diverting water from the All-American Canal to the Coachella Valley. Soon after construction of both canals, leakage from the unlined canals began creating mounds of ground water beneath the canals. To prevent significant loss of water from the Coachella Canal, the United States Bureau of Reclamation reconstructed the first 49 miles with a new concrete lined canal. The new canal is located east of the older reach and was completed in 1980. Gradual improvements took place during the three decades from 1950 to 1980. Today, Imperial County has a complex system of irrigation and drainage canals that serve communities with water for various agricultural and domestic purposes.

In addition to the Imperial and Coachella Valleys, the south end of the Palo Verde Valley lies at the northeast corner of Imperial County. The Palo Verde Water District supplies water to this area from the Colorado River.





## APPENDIX B

### RESOURCE ASSESSMENT

#### I. Surface Waters

A description of the water quality of the major surface waters is discussed below. The discussion will focus on each type of surface water such as the Colorado River, the All-American Canal, the New River, Alamo River and other drains, and the Salton Sea.

##### **The Colorado River**

Excessive salinity concentrations have long been recognized as one of the major quality problems of the Colorado River, which provides municipal and industrial water to nearly fourteen million people, and irrigates approximately 700,000 acres of farmland. The Colorado River's heavy salt load is derived from both natural and human activities, each contributing about half the total amount. An estimated nine million tons of dissolved salts pass Hoover Dam each year, causing California water users an estimated \$100 million in annual damages. Without measures to control it, salinity in the lower reaches of the river will continue to cause major water quality problems.

In 1975, the seven Colorado River Basin States (California, Arizona, Nevada, Utah, Wyoming, Colorado and New Mexico), with the Environmental Protection Agency's approval, adopted water quality standards for river salinity at three stations: 723 mg/L below Hoover Dam; 747 mg/L below Parker Dam; and 879 mg/L at Imperial Dam. Current studies show that, without control measures, salinity could reach 1,000 milligrams per liter (mg/L) at Hoover Dam by the year 2010.

Although Colorado River water still has a relatively high total of dissolved solids when compared to its headwaters, the water quality of the Imperial Valley is fairly good, with the exception of the minor quantity of rainfall it receives. As the water flows through the Colorado system it is used for agriculture and other beneficial uses, resulting in salt buildup. In addition, the erosion of the Colorado and its tributaries results in a large sediment load. Between 1980 and 1983 the total annual amount of sediments removed from the desalting basins at Imperial Dam was 5,135,168 tons. This seems relatively high but it was caused by extreme high river releases.

A summary of the water quality of the Colorado River water reaching Imperial Dam and other surface waters is shown in Table B-1. The water quality of Colorado River water reaching Imperial Dam is moderately basic (pH 8.0) and has good dissolved oxygen concentrations. The average 1980 concentration for TDS of 760 mg/L represents good quality water for irrigation use. This total is well below the criterion of 879 mg/L set by the Environmental Protection Agency for TDS at Imperial Dam. Although this value is high for drinking water, it is still



within acceptable limits. Other water quality parameters such as nitrate, phosphate, and biological oxygen demand are well within acceptable limits.

Data received from the California Regional Water Quality Control Board for annual average water quality of the Colorado River at Imperial Dam between 1988 and 1990 is shown on Table B-2 to show differences from 1980 data.

The water continues to be moderately basic with good dissolved oxygen concentrations. Total dissolved solids of the Colorado River at Imperial Dam have risen from 685 mg/L in 1988 to 731 mg/L in 1990. This figure is lower than the 1980 reading of 760 mg/L shown in Table B-2 and is still well below the criterion of 879 mg/L set by the Environmental Protection Agency.

**TABLE B-1**  
**SUMMARY OF 1980 WATER QUALITY DATA\***  
**COLORADO RIVER AT IMPERIAL DAM AND OTHER SURFACE WATERS**

Factor	Colorado River at Imperial Dam	Alamo River Near Intl. Border	Alamo River at Salton Sea	New River at Salton Sea	Salton Sea at State Park
1. Temperature (C°)	18	19	21	21	22
2. pH	8.0	7.9	7.9	7.7	8.3
3. Dissolved O <sub>2</sub> (mg/L)	8.4	8.0	7.5	6.6	6.9
4. Turbidity (NTU's)	18	77	232	188	9
5. Specific Conductance (umhos/cm)	1,400	5,300	4,000	5,800	42,900
6. Total Dissolved Solids (mg/L)	760 <sup>**</sup>	3,396	2,817	3,496	35,845
7. Phosphate, PO <sub>4</sub> (mg/L)	0.08	0.31	0.77	0.75	0.15
8. Nitrate, NO <sub>3</sub> -N (mg/L)	0.12	0.32	7.5	5.3	0.23
9. Nitrate, NO <sub>2</sub> (mg/L)	<0.01	0.09	0.14	0.16	0.05
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	<0.01	1.3	0.5	1.0	0.6
11. Suspended Solids (mg/L)	70	120	337	262	285
12. Volatile Suspended Solids (mg/L)	42	96	278	217	233
13. MBAS (mg/L)	<0.1	<0.1	<0.1	0.1	0.3
14. COD (mg/L)	8	25	23	26	---
15. BOD 5, 20°C (mg/L)	<2	4	4	8	16
16. Fecal Coliform (MPN/100ML)	8	800	3,600	4,000	1

\* Mean Value Data

\*\* Modified Based on United State Bureau of Reclamation, 1985c.

BOD 5 = Five Day Biological Oxygen Demand

COD = Chemical Oxygen Demand

MBAS = Mephylene Blue Active Substance

Source: California Regional Water Quality Control Board, 1984.





**TABLE B-2**  
**COLORADO RIVER AT IMPERIAL DAM**  
**SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA**  
**(1988-90)**

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	26	21	20
2. pH	8.0	7.2	8.1
3. Dissolved O <sub>2</sub> (mg/L)	8.25	7.37	7.77
4. Turbidity (NTU's)	5.2	4.5	2.2
5. Specific Conductance (umhos/cm)	1,079	1,052	1,113
6. Total Dissolved Solids (mg/L)	685	706	731
7. Phosphate, PO <sub>4</sub> (mg/L)	17.4	12.7	21.7
8. Nitrate, NO <sub>3</sub> -N (mg/L)	1.3	10.0	4.0
9. Nitrate, NO <sub>2</sub> (mg/L)	.09	.03	.03
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	.20	.19	.28
11. Suspended Solids (mg/L)	<.01	<.02	NA
12. Volatile Suspended Solids (mg/L)	.09	.43	.60
13. MBAS (mg/L)	<.07	<.07	.06
14. COD (mg/L)	3.25	20	<4.75
15. BOD 5, 20°C (mg/L)	<1.0	1.45	<1.25
16. Fecal Coliform (MPN/100ML)	<20	<19	<35

BOD 5 = Five Day Biological Oxygen Demand

COD = Chemical Oxygen Demand

MBAS = Mephylene Blue Active Substance

Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly. Regional Surface Water Quality Monitoring Program, 1988-1990.

Fecal coliforms in the Colorado River at Imperial Dam have risen since 1980. In 1980, an average of only 8 MPN/100ML of fecal coliforms were recording as compared to an average of 35 MPN/100ML in 1990. This could be due to increased recreational uses along the Colorado River such as RV parks or other activities taking place.



## **The All-American Canal**

At Imperial Dam, water is diverted to the All-American Canal, which conveys water in California to the Bard Valley, and to the agricultural areas of the Imperial and Coachella Valleys. Table B-3 and B-4 summarize water salinity, from 1960 to 1984, on the All-American Canal below Drop No. 1, which diverts water to Coachella via the Coachella Canal. The salinity of the water in the All-American Canal would be expected to follow fairly closely that of the Colorado River. However, there is a fluctuation from a low of 737 ppm (1.00 ton/AF) to a high of 958 ppm (1.30 tons/AF). Without salinity control projects in the Colorado basin, the salt concentration of this water would be expected to increase. This increase is partly a result of increased diversion and use of the Colorado River water in other parts of its reach.

Data collected in 1978 and 1979 illustrates relatively little variation in water quality through the All-American Canal and Pilot Knob to the East Highline Canal. The effects of the seepage and evaporation on water quality as it passes through this part of the system are apparently minor. Additional data shows a marked increase in dissolved solids between Imperial Dam and delivered irrigation water, and also demonstrates the relatively high sulfate concentrations in the Colorado water salt composition.

Water quality data for the All-American Canal from monthly monitoring samples conducted by Imperial Irrigation District (IID) in 1983-1984, illustrated that the water had held relatively low salinity, with an average TDS of 754 mg/L, well below the criterion of 879 mg/L for delivery of Colorado River water at Imperial Dam. The quality of this water corresponds to that of the Colorado River with a basic pH ranging from 7.9 to 8.6, and low values for sodium absorption ratio (SAR). The low SAR is indicative of the fairly high concentrations of calcium and magnesium relative to the total concentration of cations (a positively charged ion), and it shows a quality of water very suitable for continued agricultural use.

## **The New River, Alamo River, and Drains**

The New River flows into the Imperial Valley from Mexico with a significantly high waste load. The New River at the International Boundary has a sizable flow, the 1983 mean flow measured at 325 ft<sup>3</sup>/second. Seasonal variations in contaminant loads correspond to a late winter planting and irrigation, and a fallow fall season. As this drainage flows through the County, the flow increases dramatically as a result of drainage from the agricultural lands in the Imperial Valley. Tables B-5 and B-6 show 1983-1984 water quality data for the New River at the International Boundary and at the outlet to the Salton Sea, respectively.

As shown, the New River is polluted as it enters the United States. In 1983, TDS averaged 3,737 mg/L with a 5-day Biological Oxygen Demand (BOD) of 14 mg/L and fecal coliforms of 750,000 MPN/mL. This total indicates the intensive use of this water for irrigation in Mexico and the presence of municipal wastewater from Mexicali. To be safe for use as potable water, a source should be free of fecal coliforms.



TABLE B-3  
WATER SALINITY BELOW DROP #1 - ALL-AMERICAN CANAL  
(YEARS 1960 TO 1971)

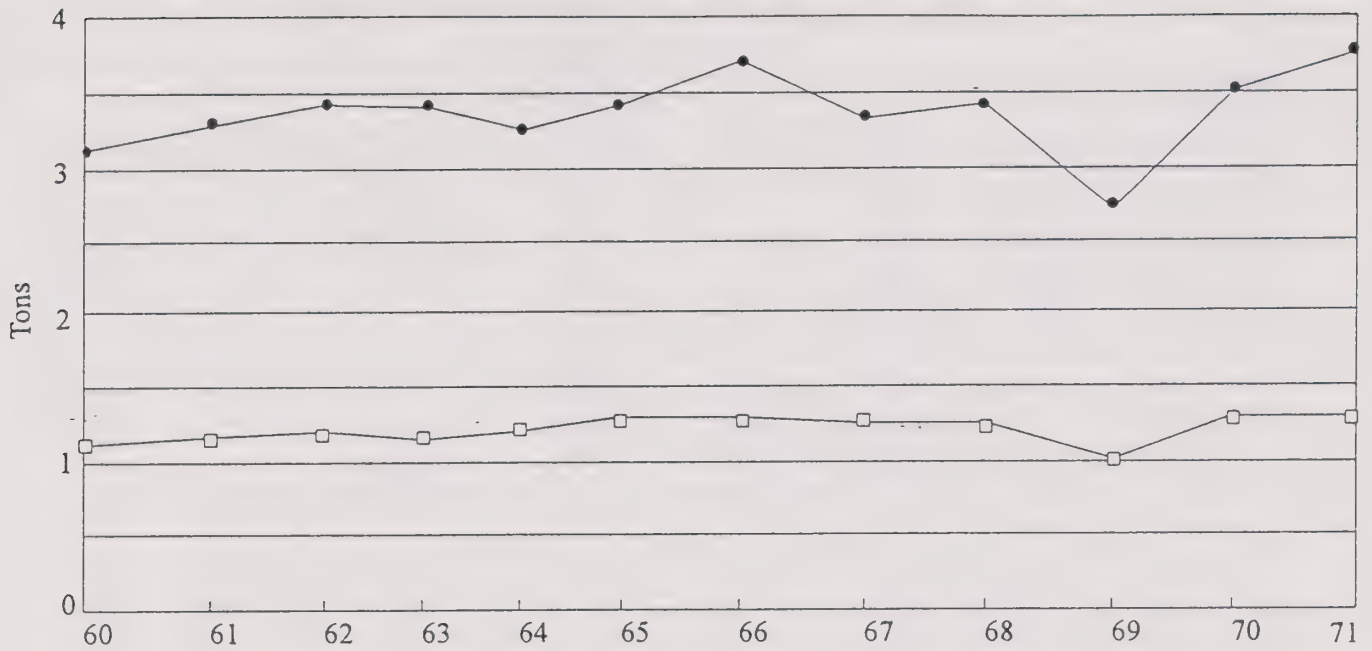
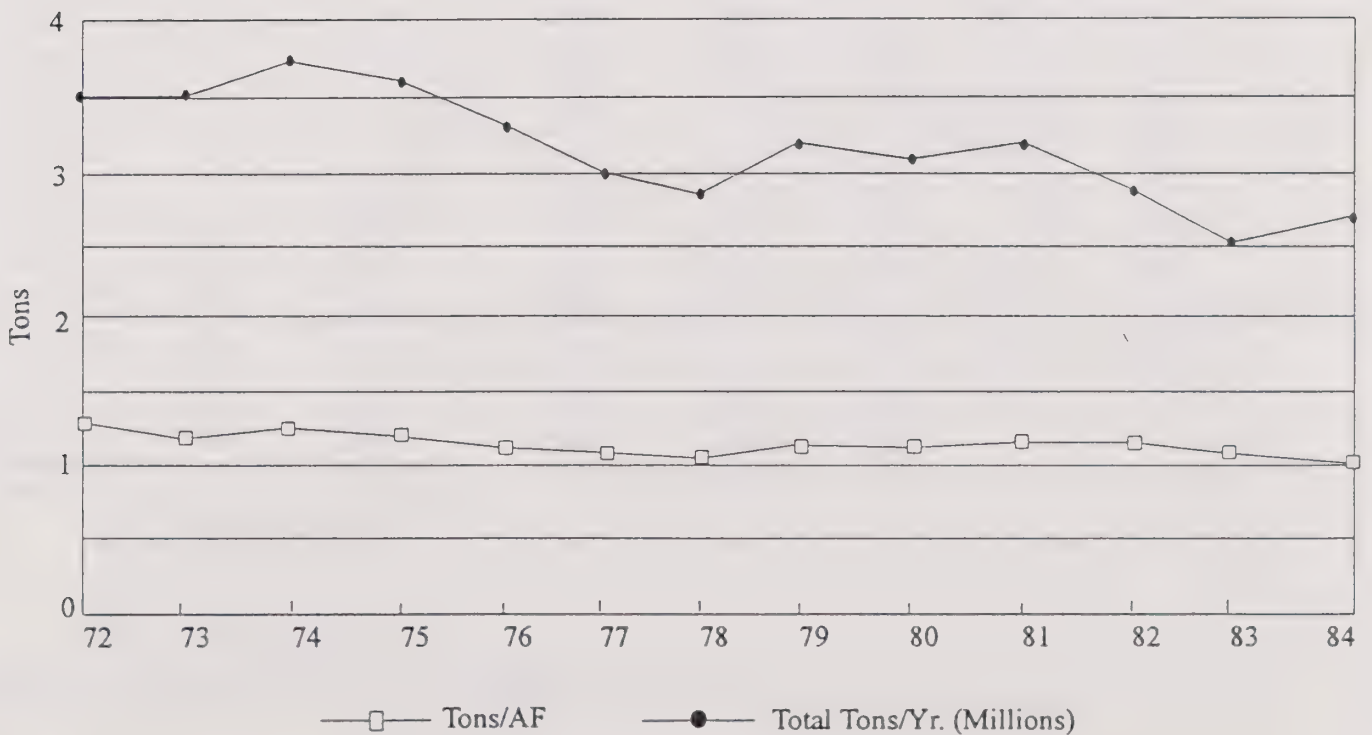


TABLE B-3  
WATER SALINITY BELOW DROP #1 - ALL-AMERICAN CANAL  
(YEARS 1972 TO 1984)







**TABLE B-5**  
**NEW RIVER WATER QUALITY AT CALEXICO**  
**(MONTHLY, 1983-1984)**

Date	Flow (ft <sup>3</sup> /sec)	TDS (mg/L)	Conductivity (Kx10 <sup>6</sup> )	pH	SAR	NA (epm)	Ca + Mg (epm)
Jan 83	199	4,182	6,440	----	12.79	44.67	24.40
Feb 83	429	4,250	5,140	----	12.72	45.62	25.73
Mar 83	324	4,266	5,980	----	10.54	39.80	28.53
Apr 83	319	4,554	6,640	----	14.03	50.20	25.60
May 83	390	4,070	5,530	----	09.88	35.70	26.13
Jun 83	324	4,578	5,180	7.90	13.41	49.21	29.94
Jul 83	361	4,988	6,450	7.80	14.13	51.60	26.67
Aug 83	378	3,296	5,070	8.10	0.26	31.26	22.80
Sep 83	411	2,846	5,000	8.00	08.99	28.42	20.00
Oct 83	416	3,036	4,620	7.70	08.66	28.28	21.33
Nov 83	338	3,156	5,370	7.60	08.97	29.84	22.14
Dec 83	313	3,270	5,085	7.80	09.78	09.78	33.21
Jan 84	347	3,880	5,370	7.80	11.01	38.05	23.87
Feb 84	387	3,994	5,640	8.00	11.25	40.14	25.47
Mar 84	384	3,258	5,240	8.10	06.56	24.12	27.07
Apr 84	414	3,246	5,130	8.20	07.21	26.63	27.26
May 84	419	3,628	5,130	8.60	07.77	29.63	29.07
Jun 84	329	3,424	5,000	8.10	13.70	41.65	18.48
Jul 84	333	3,234	5,040	8.50	11.04	33.50	18.40
Aug 84	403	3,838	6,030	8.00	14.65	44.05	18.08
Sep 84	371	3,192	4,860	8.60	10.90	33.52	18.93
Oct 84	425	2,644	4,090	8.40	08.49	25.35	17.84
Nov 84	355	2,722	3,750	8.40	08.09	24.59	18.49
Dec 84	430	3,513	6,000	8.00	10.59	33.30	19.76
Average	367	3,628	5,350	8.08	10.60	----	----

Note: Ca + Mg = Calcium plus Magnesium  
epm = equivalents per million  
K = Potassium  
Na = Sodium  
SAR = Sodium Adsorption Rate  
TDS = Total Dissolved Solids

Source: Imperial Irrigation District Water Quality Data, 1983-1984.



**TABLE B-6**  
**NEW RIVER WATER QUALITY AT THE OUTLET INTO THE SALTON SEA**  
**(1983-1984)**

Date	Flow (ft <sup>3</sup> /sec)	TDS (mg/L)	Conductivity (Kx10 <sup>6</sup> )	pH	SAR	NA (epm)	Ca + Mg (epm)
Jan 83	494	4,100	5,720	----	10.15	38.23	28.40
Feb 83	1,147	4,000	4,110	----	09.86	37.40	28.80
Mar 83	1,231	2,942	4,230	----	05.26	19.16	26.53
Apr 83	777	3,320	4,980	----	08.78	30.16	23.60
May 83	780	3,274	4,770	----	08.84	30.00	23.06
Jun 83	665	3,408	4,940	8.00	08.73	30.32	24.14
Jul 83	665	3,800	6,450	7.40	10.81	37.19	23.67
Aug 83	675	3,202	4,100	8.40	08.31	27.88	22.53
Sep 83	733	3,188	4,770	7.50	08.05	27.89	24.00
Oct 83	755	3,090	4,620	7.70	07.09	25.24	25.33
Nov 83	664	3,238	5,670	7.40	07.71	28.09	26.53
Dec 83	618	3,258	5,080	7.60	07.65	28.16	27.07
Jan 84	657	3,454	5,370	7.60	07.09	26.91	28.80
Feb 84	721	3,302	5,979	7.80	07.75	28.23	26.53
Mar 84	835	3,042	4,740	7.80	06.02	21.71	26.00
Apr 84	893	3,036	4,660	8.10	06.23	22.74	26.67
May 84	842	3,200	4,460	8.20	06.85	25.01	26.67
Jun 84	698	3,164	4,750	8.20	12.19	35.99	17.43
Jul 84	658	3,084	4,800	8.50	07.41	25.25	23.20
Aug 84	787	3,424	5,400	8.20	10.57	34.10	20.80
Sep 84	726	3,178	4,860	8.40	07.54	26.11	24.00
Oct 84	795	2,894	4,440	8.50	08.49	26.03	18.80
Nov 84	707	3,044	4,220	8.70	08.34	26.05	19.52
Dec 84	690	3,570	6,500	8.00	10.89	36.21	22.12
Average	759	3,301	4,957	8.00	08.36	----	----

Note: Ca + Mg = Calcium plus Magnesium  
epm = equivalents per million  
K = Potassium  
Na = Sodium  
SAR = Sodium Adsorption Rate  
TDS = Total Dissolved Solids

Source: Imperial Irrigation District Water Quality Data, 1983-1984.





It can be seen from the averages of Tables B-5 and B-6 that the pH balance of the New River remained fairly constant. Average flows of the New River at the International Boundary were 367 cubic feet per second and 759 cubic feet per second at the outlet into the Salton Sea, and increase of 392 cubic feet per second over a two year period. Average total dissolved solids decreased from 3,628 mg/L to 3,302 mg/L for the same time period.

Table B-7 shows the water quality of the New River, as it passes through the City of Calexico, which was monitored on three different days between December of 1990 and May of 1991 by the California Regional Water Quality Control Board. The average of the data is summarized in Table B-7.

The average pH balance of the water is 7.6. Between December 3, 1990 and May 14, 1991, total dissolved solids increased by 364 mg/L, however, other water parameters such as phosphate, nitrate and nitrite have decreased. In addition, fecal coliforms decreased from 725,000 (MPN/100ML) in December, 1990 to 240,000 (MPN/100ML) in May, 1991. This is probably due to an increase in water flow in the month of May due to higher water demands based on warmer temperatures. Increases in water levels causes fecal coliforms to dilute in the water, thus reducing their abundance. Table B-8 summarizes the average annual water quality data for the New River near the outlet to the Salton Sea.

The average pH balance of the New River decreased slightly at the outlet between 1988-90 compared to the 1983-84 data of Table B-6 which showed a pH of 8.0. Total dissolved solids has remained relatively constant between 1988-90. Fecal coliforms have decreased by a large margin between 1989 and 1990, a difference of 19,300 (MPN/100ML).

Tables B-9 and B-10 show 1983-84 water quality data for the Alamo River at the International Boundary and at the outlet, respectively. The Alamo River has a very low flow at the International Boundary, being typically less than 5 ft<sup>3</sup>/second. Water quality data at this location as shown in Table B-9 indicates that the water already has very high "Total Dissolved Solids" as it enters the Valley, from agricultural lands in Mexico. The data also shows the limited presence of other contaminants, given the limited urban development in this portion of the Alamo River drainage area.

As Table B-10 indicates, agricultural runoff, community waste water runoff and other contributions to the Alamo River in Imperial County act to dilute the total suspended solids and other contaminants. This results in a reduced pollutant load being discharged into the Salton Sea than that entering the County from Mexico.

Table B-11 shows average annual water quality data for the Alamo River near the International Boundary between 1988-90. Total dissolved solids have increased slightly over the past three years. However, total dissolved solids at the outlet decrease as shown in Table B-12. Phosphate, nitrate, nitrite, and ammonia fluctuated slightly, while fecal coliform averages in 1990 decreased incredibly to 950 MPN/100ML from the average of 18,975 in 1989.



**TABLE B-7**  
**NEW RIVER AT CALEXICO**  
**SUMMARY OF AVERAGE WATER QUALITY DATA**  
**FOR SPECIFIC DATES**  
**(1990-91)**

Factor	Monitoring Dates		
	12/3/90	3/14/91	5/14/91 - 5/15/91
1. Temperature (C°)	12	15	21
2. pH	7.6	7.5	7.7
3. Dissolved O <sub>2</sub> (mg/L)	4.0	1.5	2.1
4. Turbidity (NTU's)	24	NA	32
5. Specific Conductance (umhos/cm)	4,703	4,795	5,067
6. Total Dissolved Solids (mg/L)	2,780	2,946	3,196
7. Phosphate, PO <sub>4</sub> (mg/L)	2.06	1.8	1.6
8. Nitrate, NO <sub>3</sub> -N <sup>4</sup> (mg/L)	.47	3.4	0.3
9. Nitrate, NO <sub>2</sub> -N (mg/L)	.21	0.05	0.03
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	3.8	6.8	4.5
11. Suspended Solids (mg/L)	33	60	22
12. Volatile Suspended Solids (mg/L)	23	2.8	NA
13. MBAS (mg/L)	4.6	4.2	1.02
14. COD (mg/L)	81	68	95
15. BOD 5, 20°C (mg/L)	13	13	1.02
16. Fecal Coliform (MPN/100ML)	725,000	200,000	240,000

Note: For 12/3/90 and 3/14/91 data, items 1-5 are averages of the readings taken between 6:00 a.m. and 3:00 p.m. Items 6-10 are total concentration readings taken between the same time period. For 5/14/91 and 5/15/91 data, items 1-5 are averages of the readings taken between 8:00 a.m. on 5/14 and 7:00 a.m. on 5/15. Items 6-10 are total concentration readings taken between the same time period. Item 16 for all three dates is the average of past years median data.

BOD 5 = Five Day Biological Oxygen Demand

COD = Chemical Oxygen Demand

MBAS = Mephylene Blue Active Substance

Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1990-1991.





**TABLE B-8**  
**NEW RIVER NEAR THE OUTLET TO SALTON SEA**  
**SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA**  
**(1988-90)**

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	20	21	21
2. pH	7.8	7.3	7.6
3. Dissolved O <sub>2</sub> (mg/L)	6.2	7.0	4.5
4. Turbidity (NTU's)	86	84	104
5. Specific Conductance (umhos/cm)	4,050	4,153	3,898
6. Total Dissolved Solids (mg/L)	2,774	2,825	2,566
7. Phosphate, PO <sub>4</sub> (mg/L)	0.82	1.11	0.80
8. Nitrate, NO <sub>3</sub> -N (mg/L)	6.08	8.90	3.90
9. Nitrate, NO <sub>2</sub> -N (mg/L)	0.81	0.91	0.63
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	1.59	1.12	3.23
11. Suspended Solids (mg/L)	236	344	333
12. Volatile Suspended Solids (mg/L)	25	117	31
13. MBAS (mg/L)	0.36	0.52	0.77
14. COD (mg/L)	37	91	30
15. BOD 5, 20°C (mg/L)	9	10	9
16. Fecal Coliform (MPN/100ML)	14,225	25,700	6,400
BOD 5 = Five Day Biological Oxygen Demand COD = Chemical Oxygen Demand MBAS = Mephylene Blue Active Substance Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Monitoring Program, 1988-1990.			





**TABLE B-9**  
**ALAMO RIVER**  
**WATER QUALITY AT THE INTERNATIONAL BOUNDARY**  
**(1983-84)**

Date	Flow (ft <sup>3</sup> /sec)	TDS (mg/L)	Conductivity (Kx10 <sup>6</sup> )	pH	SAR	NA (epm)	Ca + Mg (epm)
Jan 83	1	3,888	5,720	----	08.50	32.42	29.07
Feb 83	1	3,800	5,710	----	08.73	32.99	28.54
Mar 83	3	3,982	5,350	----	09.49	34.55	26.53
Apr 83	3	4,294	5,860	----	10.84	40.75	28.26
May 83	3	4,678	6,560	----	12.13	45.37	28.00
Jun 83	3	4,400	5,810	7.80	10.91	41.19	28.53
Jul 83	2	3,690	4,690	7.80	10.27	36.45	25.20
Aug 83	3	3,796	4,440	8.10	10.13	35.14	25.54
Sep 83	3	3,658	5,000	8.50	08.47	30.92	26.66
Oct 83	2	3,660	5,650	7.80	08.29	31.31	28.53
Nov 83	2	3,848	4,860	7.60	08.11	30.79	28.28
Dec 83	2	4,120	5,640	7.80	07.29	30.58	35.20
Jan 84	3	3,714	5,100	7.80	05.64	24.03	26.27
Feb 84	3	4,112	5,980	7.80	08.22	33.10	32.40
Mar 84	3	4,180	6,230	8.10	09.22	34.83	28.54
Apr 84	3	3,212	5,700	8.20	11.15	41.73	28.00
May 84	4	4,222	5,700	8.20	10.10	39.05	29.87
Jun 84	1	2,609	3,700	8.30	10.50	29.58	15.87
Jul 84	2	4,180	5,600	8.60	11.36	39.77	24.53
Aug 84	4	2,578	3,950	8.20	07.15	21.68	18.40
Sep 84	2	4,302	6,380	8.60	11.42	40.42	25.07
Oct 84	2	4,296	6,390	8.50	10.91	39.33	26.00
Nov 84	3	3,402	4,050	8.60	08.88	31.78	25.60
Dec 84	3	3,954	6,500	8.10	10.86	40.34	27.58
Average	3	3,857	5,440	8.13	09.52	----	----

Note: Ca+Mg = Calcium plus Magnesium

epm = equivalents per million

K = Potassium

Na = Sodium

SAR = Sodium Adsorption Rate

TDS = Total Dissolved Solids

Source: Imperial Irrigation District Water Quality Data, 1983-1984.



**TABLE B-10**  
**ALAMO RIVER**  
**WATER QUALITY AT THE OUTLET INTO THE SALTON SEA**  
**(1983-84)**

Date	Flow (ft <sup>3</sup> /sec)	TDS (mg/L)	Conductivity (Kx10 <sup>6</sup> )	pH	SAR	NA (epm)	Ca + Mg (epm)
Jan 83	567	2,726	3,960	-----	5.18	17.95	24.00
Feb 83	994	2,832	3,950	-----	4.99	17.70	25.20
Mar 83	1,439	2,568	3,500	-----	4.35	15.03	23.87
Apr 83	1,075	2,456	3,440	-----	3.81	13.34	24.54
May 83	919	2,800	3,180	-----	7.32	24.35	22.13
Jun 83	802	2,522	3,530	8.00	4.28	15.31	25.60
Jul 83	687	2,710	3,680	7.80	6.65	21.78	21.46
Aug 83	666	2,738	3,810	8.30	4.50	16.19	25.86
Sep 83	850	2,822	3,750	7.50	5.70	19.75	24.00
Oct 83	872	2,860	3,910	7.80	5.50	19.54	25.20
Nov 83	760	3,054	4,250	7.40	6.23	22.47	26.00
Dec 83	592	3,234	4,620	7.60	5.56	22.07	31.47
Jan 84	649	2,930	3,640	7.60	5.68	20.84	26.93
Feb 84	773	2,654	3,910	7.80	3.26	12.52	29.47
Mar 84	910	2,334	3,430	8.00	3.10	10.85	24.53
Apr 84	1,142	2,354	3,420	8.20	3.29	11.65	25.06
May 84	978	2,420	3,420	8.20	3.56	12.67	25.33
Jun 84	696	2,449	3,600	8.30	8.31	23.23	15.62
Jul 84	670	2,584	3,730	8.50	5.18	17.32	22.40
Aug 84	626	2,856	4,100	8.40	6.64	21.83	21.60
Sep 84	698	2,900	4,250	8.40	6.06	20.41	22.67
Oct 84	889	2,774	3,930	8.50	6.60	21.34	20.88
Sep 84	838	2,866	3,610	8.80	6.57	21.58	21.60
Dec 84	483	3,442	5,000	8.00	7.03	26.13	27.66
Average	816	2,745	3,818	8.06	5.39	-----	-----

Note: Ca+Mg = Calcium plus Magnesium  
epm = equivalents per million  
K = Potassium  
Na = Sodium  
SAR = Sodium Adsorption Rate  
TDS = Total Dissolved Solids

Source: Imperial Irrigation District Water Quality Data, 1983-1984.





**TABLE B-11  
ALAMO RIVER  
AVERAGE ANNUAL WATER QUALITY  
NEAR INTERNATIONAL BOUNDARY**

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	20	21	20
2. pH	8.0	7.1	8.0
3. Dissolved O <sub>2</sub> (mg/L)	7.3	6.3	8.1
4. Turbidity (NTU's)	24	31	31
5. Specific Conductance (umhos/cm)	4,088	4,480	4,638
6. Total Dissolved Solids (mg/L)	2,751	3,246	3,251
7. Phosphate, PO <sub>4</sub> (mg/L)	52	76	56
8. Nitrate, NO <sub>3</sub> -N (mg/L)	9	20	13
9. Nitrate, NO <sub>2</sub> -N (mg/L)	.45	.41	.27
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	1.92	1.96	1.10
11. Suspended Solids (mg/L)	< .20	.21	.26
12. Volatile Suspended Solids (mg/L)	.55	1.31	.47
13. MBAS (mg/L)	< .07	< 0.10	.11
14. COD (mg/L)	27	101	32
15. BOD 5, 20°C (mg/L)	6.0	6.9	7.0
16. Fecal Coliform (MPN/100ML)	10,175	18,975	950
BOD 5 = Five Day Biological Oxygen Demand COD = Chemical Oxygen Demand MBAS = Mephylene Blue Active Substance Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.			



In Table B-12, the average pH balance has decreased from the average of the 1983-1984 data shown on Table B-7. Total dissolved solids remains relatively constant between 1988-90. Fecal coliform concentrations increased tremendously from 11,625 MPN/100ML in 1988 to 63,375 MPN/100ML in 1990, an increase of 51,750.

**TABLE B-12**  
**ALAMO RIVER AT THE OUTLET TO SALTON SEA**  
**SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA**  
**(1988-90)**

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	19	20	21
2. pH	7.9	7.4	7.8
3. Dissolved O <sub>2</sub> (mg/L)	7.8	8.6	6.6
4. Turbidity (NTU's)	170	96	143
5. Specific Conductance (umhos/cm)	3,113	3,297	3,038
6. Total Dissolved Solids (mg/L)	2,162	2,159	2,144
7. Phosphate, PO <sub>4</sub> (mg/L)	.52	.57	.34
8. Nitrate, NO <sub>3</sub> -N (mg/L)	8.5	13.0	5.6
9. Nitrate, NO <sub>2</sub> -N (mg/L)	.97	.97	.46
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	.96	1.45	1.25
11. Suspended Solids (mg/L)	347	396	411
12. Volatile Suspended Solids (mg/L) <sup>1</sup>	39	123	35
13. MBAS (mg/L)	< .05	.09	.06
14. COD (mg/L)	29	71	30
15. BOD 5, 20°C (mg/L)	6	7	4
16. Fecal Coliform (MPN/100ML)	11,625	20,775	5,600

BOD 5 = Five Day Biological Oxygen Demand

COD = Chemical Oxygen Demand

MBAS = Mephylene Blue Active Substance

Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.



**TABLE B-13**  
**SALTON SEA MIDPOINT NEAR COUNTY LINE**  
**SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA**  
**(1988-90)**

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	23	23	23
2. pH	8.4	8.3	8.6
3. Dissolved O <sub>2</sub> (mg/L)	13.2	11.3	14.2
4. Turbidity (NTU's)	16.0	5.2	10.2
5. Specific Conductance (umhos/cm)	56,412	36,600	41,725
6. Total Dissolved Solids (mg/L)	41,966	40,043	42,421
7. Phosphate, PO <sub>4</sub> (mg/L)	.54	.40	.08
8. Nitrate, NO <sub>3</sub> -N (mg/L)	< .03	< .54	.25
9. Nitrate, NO <sub>2</sub> -N (mg/L)	< .23	< .03	.13
10. Ammonia NH <sub>3</sub> /NH <sub>4</sub> + -N (mg/L)	.42	1.14	1.55
11. Suspended Solids (mg/L)	7.9	34.5	25.3
12. Volatile Suspended Solids (mg/L)	5.0	6.2	11.0
13. MBAS (mg/L)	.30	.27	.22
14. COD (mg/L)	166	255	351
15. BOD 5, 20°C (mg/L)	17	4.6	11.3
16. Fecal Coliform (MPN/100ML)	< 2	2.5	< 2

BOD 5 = Five Day Biological Oxygen Demand  
 COD = Chemical Oxygen Demand  
 MBAS = Mephylene Blue Active Substance  
 Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.





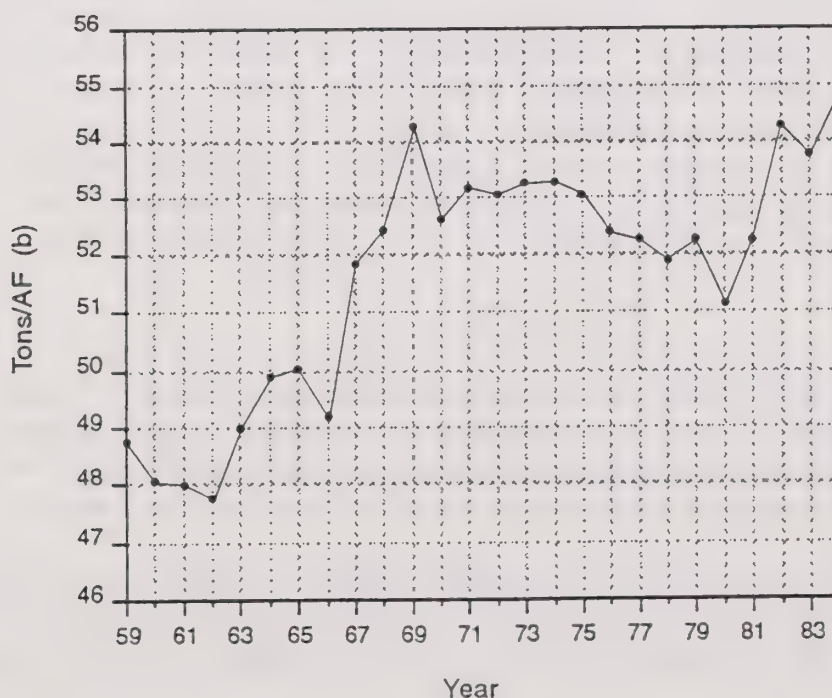
As the New River and Alamo Rivers flow toward the Salton Sea, the water quality does not degrade significantly. About forty-six percent of the inflow comes from the Alamo River and thirty-eight percent comes from the New River. The remainder of the inflow comes from smaller creeks, washes, agricultural drains and ground water seepage. Approximately twelve percent of the total inflow comes from Mexico, carried primarily by the New River. The flows increase dramatically as they receive drainage from irrigated fields which results in high TDS concentrations due to the leaching of salts from this land. Fecal coliform concentrations are reduced, probably due to the dilution effect of these drainage waters which are also contaminated.

### The Salton Sea

The historic data on the Salton Sea shows a gradual increase in the concentration of dissolved salts. This increase has resulted from the high evaporation rates and continual inflow of drainage waters with high salt loads from canals and laterals in Imperial Valley and from agricultural activity in Mexico. The Salton Sea has no outlet, occurring in a fault-controlled sub-sea level basin.

At present, the water quality problem facing the Salton Sea continues to be increasing salinity. Approximately five million tons of salt per year are carried into the Salton Sea. The current salinity of the Salton Sea is approximately 45,000 mg/L of total dissolved solids and increases by about 800 mg/L per year. Most of the important species of fish inhabiting the sea were originally from the Gulf of California, where the salinity level is approximately 35,000 mg/L. Previous tests have indicated that spawning of these fish is adversely affected at salinity levels above 40,000 mg/L. When salinity increases to about 45,000 mg/L it is very questionable if a viable fishery can continue to exist. Table B-14 shows the salinity of the Salton Sea from 1959 to 1984.

**TABLE B-14**  
**SALTON SEA SALINITY (A)**





An analysis of the major ions of Salton Sea water in 1984 shows the dominance of sodium and chloride ions, but with a substantial proportion of calcium and magnesium sulfates. The proportion of calcium, magnesium, and sulfate ions, however, is higher than that found in natural ocean water. Dissolved oxygen concentrations are high in the winter months, and high concentrations of total organic carbon were found. These parameters are indicative of the high productivity of the Salton Sea during the winter season. At other times of the year, anoxic or very low dissolved oxygen concentrations can result from the decay of this biomass.

The salinity of the Salton Sea is expected to increase in the next few years if appropriate measures are not taken. The projections of the rate of increase depend upon changes to the salinity of the Colorado River water, the effect of water conservation measures on salt loading, and other factors such as the development of industrial water users and salinity control projects.

Assuming an average future inflow of four point seventy-four (4.74) million tons per year (average of 4.44 and 5.04, which are historical salt loading measurements in million tons per year between 1963-80), the salinity of the sea based on its present level would increase at the rate of approximately 480 parts per million per year (ppm/year). The actual salinity will vary depending on the dilution effect of runoff and other factors, such as loading from Mexico.

Total dissolved solids were high in these years. This increase in total dissolved solids can be expected to continue if measures to reduce salinity are not taken. Fecal coliforms are low in this portion of the Sea but higher concentrations are found at the outlet of the New and Alamo Rivers into the Salton Sea. Phosphate, nitrate, nitrite and ammonia are within acceptable limits.

Another problem facing the Salton Sea is that of selenium. The California Regional Water Quality Control Board has provided funds since 1988 for the United States Geological Survey to conduct studies on the levels of selenium in the Salton Sea. The studies have shown that the selenium getting into the Salton Sea is originally from the Colorado River, which contains approximately one to two part per billion (ppb) of selenium. As the Colorado River water is brought into Imperial Valley by various canals, the selenium becomes concentrated due to the evaporation and evapotranspiration that occurs during farming of agricultural fields. The agricultural drains then carry this selenium enriched water into the Salton Sea. The New and Alamo Rivers contain approximately seven to eight parts per billion of selenium (ppb) when they reach the Sea.

The selenium is taken up and concentrated by small organisms, which in turn, are eaten by larger organisms. This process increases selenium concentrations. Fish in the Salton Sea have an average concentration of selenium of approximately ten parts per billion (10 ppb). Birds which feed off these fish have tissue levels of up to forty parts per billion (40 ppb). This has a potential to cause health problems in birds and is currently being studied.

Also, organochlorine pesticides affect the local fish and wildlife in agricultural drains and in the New and Alamo Rivers of Imperial Valley. The concentration levels of these chemicals in the fish of these waterways are higher than the levels found in Salton Sea fish by a factor of ten or





more. Birds also have high levels of these chemicals. The United States Department of Fish and Wildlife is currently studying this problem. The California Regional Water Quality Control Board Has focused on efforts to control toxic compounds detected in Agricultural drains in the Imperial Valley.

## **II. Groundwater**

The legal and institutional planning process for water planning is established through a complex arrangement of land use and environmental laws, and agency responsibilities which involve federal, state and local governments. The purpose of the County Water Element is to provide a framework that includes project coordination in the review and approval of any project in Imperial County. The following outline briefly provides, the legal and institutional framework for water management planning.

For planning and reporting purposes, the Colorado River Basin Region has been divided into seven major planning areas by the Regional Water Quality Control Board. The basis for this division is due to the fact that each areas has different economic and hydrologic characteristics. The seven planning areas are:

1. Lucerne Valley
2. Hayfield
3. Coachella Valley
4. Anza-Borrego
5. Imperial Valley
6. Salton Sea
7. Colorado River Basin (East)

Of the seven planning areas, portions of the latter four lie within Imperial County. Each of these planning areas are discussed below in relation to groundwater hydrology and its quality.

### **Anza-Borrego Planning Area**

This planning area includes the Clark, West Salton Sea, and Anza-Borrego hydrologic units. It comprises 1,000 square miles in the southwest corner of the Region, mostly in San Diego and Imperial Counties, with a small segment in Riverside County.

Elevations range from 230 feet below sea level at the Salton Sea to over 6,000 feet along the western boundary. The principal communities in the planning area are Salton City and, in San Diego County, Borrego Springs.

Groundwater is pumped principally from unconsolidated Pleistocene sediments, but some is pumped from low-yield wells that extend to weathered and fractured bedrock. Groundwater flows in the same and general direction as surface water, to Clark Lake, Borrego Sink, and the Salton Sea. However this subsurface flow is affected by pumping and may be impeded by



faults. About 10,000 acre feet of subsurface flow reaches the Salton Sea annually. A safe yield of 22,000 acre feet/year is estimated for the planning area. Storage capacity of the groundwater basin is estimated at seven million acre feet.

### **Imperial Valley Planning Area**

This planning area comprises 2,500 square miles in the southern portion of the Region, almost all of it in Imperial County. The easterly and westerly boundaries are contiguous with the westerly and easterly boundaries of the Colorado River Basin and the Anza-Borrego planning areas, respectively. Its northerly boundary is along the Salton Sea and the Coachella Valley planning area; and its southerly boundary follows the International Boundary with Mexico. The planning area's principal feature is the flat, fertile Imperial Valley. The principal communities are El Centro and Brawley.

Groundwater is stored in the Pleistocene sediments of the Valley floor, the mesas on the west, and the East Mesa and sand hills on the east. However, the fine-grained lake sediments in the principal portion of the Imperial Valley inhibit groundwater movement, and tile-drain systems are required to dewater the sediments to a depth below the root zone of crops and to prevent the accumulation of saline water on the surface.

Few wells have been drilled in these lake sediments because the yield is poor and the water is generally saline. The few wells in the valley are for domestic use only. In the Coyote Wells hydrologic subunit and Davis hydrologic unit, which are at higher elevations, the water yield of the wells is higher and the waters are of lower salt concentration. Groundwater is the source of water supply in those areas.

Factors that diminish groundwater reserves are consumption use, evapotranspiration, evaporation from soils where groundwater is near the surface, and losses through outflow and export.

### **Salton Sea Planning Area**

This planning area consists entirely of the Salton Sea, which is a saline body of water in a natural sink between the Imperial and Coachella Valleys, in Riverside and Imperial counties. The Salton Sea is approximately 360 square miles and its surface elevation, although variable, is approximately 227 feet below mean sea level.

Replenishment of the Salton Sea is predominantly from farm drainage and seepage, and occasional and sometimes significant storm runoff, from the Coachella Valley, Imperial Valley, and the Anza-Borrego area in this Region, and from the Mexicali Valley in Mexico. The gross contributing watershed comprises about 7,500 square miles.





## **Colorado River Basin (East) Planning Area**

This planning area, also referred to as the East Colorado River Basin, encompasses the eastern portion of San Bernardino, Riverside, and Imperial counties. It is bounded on the north by Nevada, on the east by the Colorado River, which generally forms the Arizona-California State Line, on the south by Mexico, and on the west by the drainage division of the California streams directly tributary to the Colorado River. The area is characterized by desert valley and low mountains that are generally less than 4,000 feet above sea level. The Palo Verde and Bard Valleys are also within this planning unit.

Groundwater is generally unconfined in all four hydrologic units of the planning area. However, some confined zones probably exist in the more than 700 feet of alluvial sediments that form the aquifers in three of the units. The main source of water for recharging the groundwater basins is percolation of runoff. However, in localized groundwater basins next to the Colorado River, pumping has reversed the historical hydraulic gradient toward the river, carrying recharge from the river. Also, in irrigated portions of the Colorado River Basin Region, deep percolation of applied water from the Colorado River replenishes the groundwater. An additional source is the deep percolation of seepage from the unlined portion of the All-American Canal.

Subsurface water flows from each hydrologic unit toward the Colorado River, except from those local areas where the normal hydraulic gradient has been reversed by pumping or impeded by a natural barrier such as bedrock. Natural groundwater barriers are known to exist at two locations. These are near West Well in the Chemehuevi hydrologic unit, where subsurface water rises to within five feet of the surface, and in the Arroyo Seco hydrologic subunit, but there are no known wells in these areas.





## APPENDIX C

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The following table shows the results of the experiment. The first column shows the number of trials, the second column shows the number of correct responses, and the third column shows the percentage of correct responses. The data is as follows:

Number of trials	Number of correct responses	Percentage of correct responses
10	8	80%
20	15	75%
30	22	73.3%
40	28	70%
50	35	70%
60	42	70%
70	48	68.6%
80	55	68.8%
90	62	68.9%
100	68	68%

The results show that the percentage of correct responses is relatively stable, ranging from 68% to 80%. This suggests that the experiment was conducted under controlled conditions and that the results are reliable.

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